

## **5.3 Comparisons Between Vehicle Activity and Ambient Air Quality by Day-of-Week**

### **5.3.1 Abstract**

Measurements of ozone precursors in Los Angeles and Orange Counties demonstrate clear relationships to traffic activity. Hourly profiles for carbon monoxide (CO) and nitrogen oxides (NO<sub>x</sub>) respond to the hourly activity of traffic on freeways for each day of the week. Data for activity on surface streets was not available. The CO and NO<sub>x</sub> responses are consistent with expectations based on emissions inventories and the freeway activity profiles. The percent change in CO levels can be used as an approximate surrogate for the percent change in hydrocarbons (VOC or ROG).

According to a recent emissions inventory, light-duty vehicles (LDVs) account for 77% of CO and 39% of NO<sub>x</sub> emissions, while heavy-duty trucks (HDTs) account for 4% of CO and 27% of NO<sub>x</sub>. This is important because LDV and HDT activity decrease on weekends by substantially different proportions.

Weigh-in-Motion data for Los Angeles and Orange Counties (central not peripheral stations) show that the volume of LDVs on freeways is about 90% on Saturday and 78% on Sunday compared to mid-week levels. The corresponding volumes of HDTs are substantially smaller, about 39% on Saturday and 22% on Sunday when compared to mid-week volumes.

Consistent with the activity data and the inventory, the percent decrease in NO<sub>x</sub> on weekends is greater than the percent decrease in CO. The air quality data (central not peripheral sites) indicate that CO levels are about 93% on Saturday and 74% on Sunday compared to mid-week levels. The corresponding NO<sub>x</sub> levels are substantially less; NO<sub>x</sub> levels are about 75% on Saturday and 56% on Sunday when compared to mid-week levels.

The behavior of the VOC to NO<sub>x</sub> ratio was estimated using the behavior of CO measurements as a surrogate for the behavior of VOCs. As estimated, the ratio of VOC to NO<sub>x</sub> is approximately 10 to 30% higher on Saturday and 20 to 40% higher on Sunday compared to mid-week levels from midnight to 4 p.m.

An alternative analysis of the VOC to NO<sub>x</sub> ratio is consistent with the preceding estimates. The alternative analysis did not use air quality data; instead, it is based on the WIM data, the inventory data, and the hourly freeway data. With respect to mid-week levels, this analysis suggests that the VOC to NO<sub>x</sub> ratio should be approximately 27% greater on Saturday and 37% greater on Sunday. These values fall within the range of the preceding air quality analysis. Although changes in emissions from other sources of VOCs and NO<sub>x</sub> also affect ozone precursors on weekends, emissions from on-road mobile sources appear to be a major determinant of the weekend effect.

The circumstantial evidence from changes in traffic and air quality is consistent with Hypothesis #1(NO<sub>x</sub> reduction), Hypothesis #2 (NO<sub>x</sub> timing), Hypothesis #4

(Carryover at ground level), and Hypothesis #7 (Surface O<sub>3</sub> quenching). However, the data lack sufficient detail to isolate a single cause. Similarly, the data neither demonstrate nor refute Hypothesis #3 (Carryover aloft), which concerns carryover of ozone and ozone precursors above the nocturnal boundary layer.

### **5.3.2 Introduction**

Changes in the volume and composition of traffic on weekends compared to weekdays may be the single most important factor determining the ozone weekend effect. Emissions from on-road motor vehicles comprise a large share of the inventories for ozone precursors. Therefore, we compare day-of-week profiles for traffic with the corresponding profiles for relevant pollutants. For this purpose, we use the 11 sub-regions of Los Angeles and Orange Counties that were used in Section 5.2.

In the current section, we also consider the relationships between emissions and air quality as these offer insight concerning the cause(s) of the weekend effect.

### **5.3.3 Methodology**

#### **5.3.3.1 Traffic data**

For the comparisons between traffic and air quality, we use the traffic data presented in sections 5.1 and 5.2. In particular, the hourly profiles for freeway activity by day of week are the primary data that we compare to the corresponding air quality profiles.

Weigh-in-Motion data are applied as if their weekday and weekend differences on a 24-hour basis pertain to all hours of the day equally. Until data with greater temporal resolution are available, this type of assumption is required.

In addition to the summaries in sections 5.1 and 5.2, a few new tabular summaries help facilitate comparisons between traffic and the air quality data.

#### **5.3.3.2 Air quality data**

For this section, we prepared a set of air quality profiles in addition to those presented in Section 5.1. The profiles used here are based on three years of data, 1996 – 1998 for two reasons. First, using three years of data reduces the meteorological variability affecting the hourly averages. Second, traffic data collected in the summer of 1997 are best compared to air quality profiles that represent data centered on 1997.

Air quality profiles were prepared for each subregion (or domain) identified for traffic analysis in section 5.2. Each domain has a profile for CO, NO<sub>x</sub>, ozone, and the NO<sub>2</sub> to NO ratio (except Irvine/El Toro, for which NO<sub>x</sub> data were not available). To create the NO<sub>2</sub> to NO ratio for an hour of the day, we used the ratio of means rather than the mean of ratios. First, we calculated the mean for NO<sub>2</sub> and the mean for NO for

the specified hour using all relevant days. We then divided the NO<sub>2</sub> mean by the NO mean.

The ratio of means is more reliable than the mean of ratios in this case because the mean of ratios has a tendency to overestimate the true value. The mean of ratios has this tendency because very low NO concentrations in the denominator cause excessively high ratios on some days. In addition, some valid NO values may be zero due to instrument resolution and rounding. The ratio of means avoids problems that arise when attempting to divide by zero to make a daily ratio.

The profiles for CO, NO<sub>x</sub>, and ozone are presented both in original units and as proportions of their respective mid-week levels.

Profiles for the NO<sub>2</sub> to NO ratio do not include the proportional scale with respect to mid-week values; instead, only the original (unitless) scale is provided for each domain. Because the El Toro air quality (Irvine domain) site does not measure nitrogen oxides, Irvine is limited to profiles for traffic and CO.

The proportional, unitless profiles provide the primary basis for comparisons between traffic activity and air quality. This approach allows the relationships between traffic and air quality in different domains to be considered with a comparable frame of reference.

#### **5.3.3.3 Comparisons between traffic data and air quality data**

A brief emissions inventory is given in Table 5.3-1. This inventory helps us anticipate the probable effects of changes in traffic on air quality. In particular, the inventory helps to limit the potential to overstate the effects of traffic on air quality.

For general comparisons, we merged information from all 11 sub-regions that were identified in Section 5.2. Figure 5.3-1 shows composite profiles for CO expressed as a proportion of midweek CO levels. Figures 5.3-2 and 5.3-4 show comparable graphs for NO<sub>x</sub> and for freeway traffic.

The composite profile for traffic in original units is shown in Figure 5.3-5. This figure is scaled to relate to a daily total volume of one million vehicles.

The composite results for the NO<sub>2</sub> to NO ratio are shown in Figure 5.3-3.

Comparisons between traffic and air quality in each of the 11 sub-regions are based on Figures 5.3-6 through 5.2-79.

#### **5.3.4 Results and Discussion**

Tables 5.3-2 and 5.3-3 show aggregate relationships between traffic and air quality during the daylight hours. These summaries reveal a strong effect of the morning commute traffic on air quality in the morning hours.

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In addition, Table 5.3-3 shows that the change in air quality is damped. That is, the low points in air quality are higher than the low points in the traffic volume and the high points in air quality are lower than the high points for traffic. This phenomenon probably occurs for more than one reason.

First, the atmosphere acts as a sponge, absorbing emissions for multiple hours to arrive at its present content of a pollutant. Therefore, air quality behaves similar to a moving average that overcuts the valleys and undercuts the peaks.

Second, traffic is not the only source of ozone precursors. The activity of these other sources is unlikely to follow exactly the same profile as traffic activity. Therefore, the aggregate profile for the sum of emissions from the multiple sources will not follow any one source but will reflect the sum of the profiles.

The  $\text{NO}_2$  to NO ratios at Lynwood and Reseda invite further investigation. The ratio at Lynwood is substantially smaller than the ratio for any other location. There are at least two possible explanations for the  $\text{NO}_2$  to NO ratio at Lynwood. First, the area may have a large source of fresh NO emissions throughout the day? Second, the data could reflect a systematic error in calibrating the “zero” level for NO; if the denominator (NO) is bounded away from zero, then the  $\text{NO}_2$  to NO ratio would be underestimated.

At Reseda, the profiles are unique among the sites considered. On all days of the week, the profile dips in the afternoon and rises again toward evening. This afternoon dip is substantial and Saturday and Sunday even dip below the weekday  $\text{NO}_2$  to NO ratio during this time.

The profiles at Reseda indicate a mid-day increase in fresh NO emissions or a mid-day decrease in  $\text{NO}_2$ . Furthermore, the cause seems to exert itself even more strongly on weekdays.

An obvious feature of the CO and  $\text{NO}_x$  profiles is that they are not simply a constant fraction of the mid-week levels. These profiles indicate that both the amount and the timing of ozone precursors are significantly different on weekends compared to weekdays.

### **5.3.5 Conclusions**

With respect to ozone, three of the weekend-effect hypotheses focus primarily on emissions during the daylight hours. Hypothesis #1 ( $\text{NO}_x$ -reduction) focuses on the aggregate difference between emissions on weekdays compared to weekends, Hypothesis #2 ( $\text{NO}_x$ -timing), focuses on when emissions occur on weekdays compared to weekends, and Hypothesis #7 considers ozone quenching by fresh emissions of NO.

All three of these hypotheses are circumstantially consistent with the relationship between the amount and timing of traffic and the amount and timing of ambient levels of CO (VOC surrogate) and  $\text{NO}_x$ .

Hypothesis #4 (Carryover near the surface) and Hypothesis #3 (carryover aloft) concern carryover of ozone and/or precursors. According to Hypothesis #4, traffic during the early morning hours (midnight to 5 a.m.) on Saturday and Sunday is greater than the mid-week levels. Therefore, additional amounts of ozone precursors are injected into the nocturnal boundary layer during these hours.

For CO (as a surrogate for VOC's), the diurnal profiles generally support the idea that emissions are greater on Friday and Saturday nights compared to other nights. For NO<sub>x</sub>, the evidence is mixed with NO<sub>x</sub> being greater than mid-week levels on weekends at some sites and equal or lower on weekends at other sites.

Overall, however, the diurnal profiles for CO and NO<sub>x</sub> indicate that carryover near the surface is not a plausible cause of the ubiquitous ozone weekend effect in the South Coast Air Basin. Ambient concentrations of CO and NO<sub>x</sub> during the daylight hours are lowest on Sunday for all sub-regions examined, while the ozone weekend effect is most pronounced on Sundays at all locations in the basin.

Hypothesis #3 cannot be evaluated directly with the current data. This hypothesis asserts that ozone and ozone precursors that carryover above the nocturnal boundary layer strongly influence surface ozone concentrations on the following day. This possibility is important because the conditions aloft are similar to the conditions "downwind" (Sillman, 1999). That is, the conditions aloft may be strongly NO<sub>x</sub>-limited rather than VOC-limited.

### **5.3.6 Recommendations**

Extend the analyses when data are available. The desired extensions include:

- Hourly traffic on both freeways and surface streets.
- Hourly traffic identified by weight class.
- Local emission inventories for comparison to local ambient data.
- High quality data for VOC's rather than using CO as a surrogate.
- Spatial coverage to include Riverside and San Bernardino Counties.

These recommendations address some of the gaps in the data that now prevent clear differentiation between alternative causes of the weekend effect.

### **5.3.7 References**

Sillman, S. (1999) "The relation between ozone, NO<sub>x</sub>, and hydrocarbons in urban and polluted rural environments," *Atmospheric Environment*, **33**: 1821-1845.

**Table 5.3-1 Brief emission inventories for the South Coast Air Basin.**

<b>Source Category</b>	<b>Reactive Organic Gases</b>		<b>Nitrogen Oxides</b>		<b>Carbon Monoxide</b>	
	<b>1995</b>	<b>2000</b>	<b>1995</b>	<b>2000</b>	<b>1995</b>	<b>2000</b>
<b>Stationary Sources</b>	<b>275</b>	<b>279</b>	<b>144</b>	<b>118</b>	<b>71</b>	<b>66</b>
<b>Area-Wide Sources</b>	<b>228</b>	<b>200</b>	<b>31</b>	<b>34</b>	<b>716</b>	<b>633</b>
<b>On-Road Mobile Sources:</b>	<b>1031</b>	<b>730</b>	<b>1045</b>	<b>844</b>	<b>9653</b>	<b>6525</b>
Heavy-Duty Trucks	<b>41</b>	<b>36</b>	<b>328</b>	<b>348</b>	<b>431</b>	<b>302</b>
Other Vehicles	<b>990</b>	<b>694</b>	<b>718</b>	<b>496</b>	<b>9223</b>	<b>6223</b>
<b>Other Mobile Sources</b>	<b>108</b>	<b>108</b>	<b>270</b>	<b>268</b>	<b>870</b>	<b>808</b>
<b>Natural Sources</b>	<b>n/a</b>	<b>4</b>	<b>n/a</b>	<b>5</b>	<b>n/a</b>	<b>106</b>
<b>Total</b>	<b>1642</b>	<b>1321</b>	<b>1490</b>	<b>1269</b>	<b>11310</b>	<b>8138</b>

<b>Percent of total by Year</b>						
<b>Stationary Sources</b>	<b>16.7%</b>	<b>21.1%</b>	<b>9.7%</b>	<b>9.3%</b>	<b>0.6%</b>	<b>0.8%</b>
<b>Area-Wide Sources</b>	<b>13.9%</b>	<b>15.1%</b>	<b>2.1%</b>	<b>2.7%</b>	<b>6.3%</b>	<b>7.8%</b>
<b>On-Road Mobile Sources:</b>	<b>62.8%</b>	<b>55.3%</b>	<b>70.1%</b>	<b>66.5%</b>	<b>85.3%</b>	<b>80.2%</b>
Heavy-Duty Trucks	<b>2.5%</b>	<b>2.7%</b>	<b>22.0%</b>	<b>27.4%</b>	<b>3.8%</b>	<b>3.7%</b>
Other Vehicles	<b>60.3%</b>	<b>52.5%</b>	<b>48.2%</b>	<b>39.1%</b>	<b>81.5%</b>	<b>76.5%</b>
<b>Other Mobile Sources</b>	<b>6.6%</b>	<b>8.2%</b>	<b>18.1%</b>	<b>21.1%</b>	<b>7.7%</b>	<b>9.9%</b>
<b>Natural Sources</b>		<b>0.3%</b>		<b>0.4%</b>		<b>1.3%</b>

Note: Values representing mobile sources are based on EMFAC 2000 (v.199). The heavy-duty truck category includes all trucks weighing 8500 lbs. and up. Other values are based on the CEFS 1996 Base Year Forecast Scenarios for the 2000 Almanac.

**Table 5.3-2 Comparison of traffic and air quality during daylight hours (6 a.m. through 8 p.m.) expressed as percent of the midweek (Tue. – Thu.) average.**

<b>Parameter</b>	<b>Sun</b>	<b>Mon</b>	<b>Tue</b>	<b>Wed</b>	<b>Thu</b>	<b>Fri</b>	<b>Sat</b>
<b>Traffic</b>	<b>70%</b>	<b>98%</b>	<b>100%</b>	<b>100%</b>	<b>101%</b>	<b>98%</b>	<b>83%</b>
<b>Carbon Monoxide</b>	<b>73%</b>	<b>96%</b>	<b>100%</b>	<b>99%</b>	<b>100%</b>	<b>104%</b>	<b>89%</b>
<b>Nitrogen Oxides</b>	<b>60%</b>	<b>92%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>75%</b>

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**Table 5.3-3 Comparison of traffic and air quality showing that levels of precursors exhibit a “damped” response to changes in traffic volumes.**

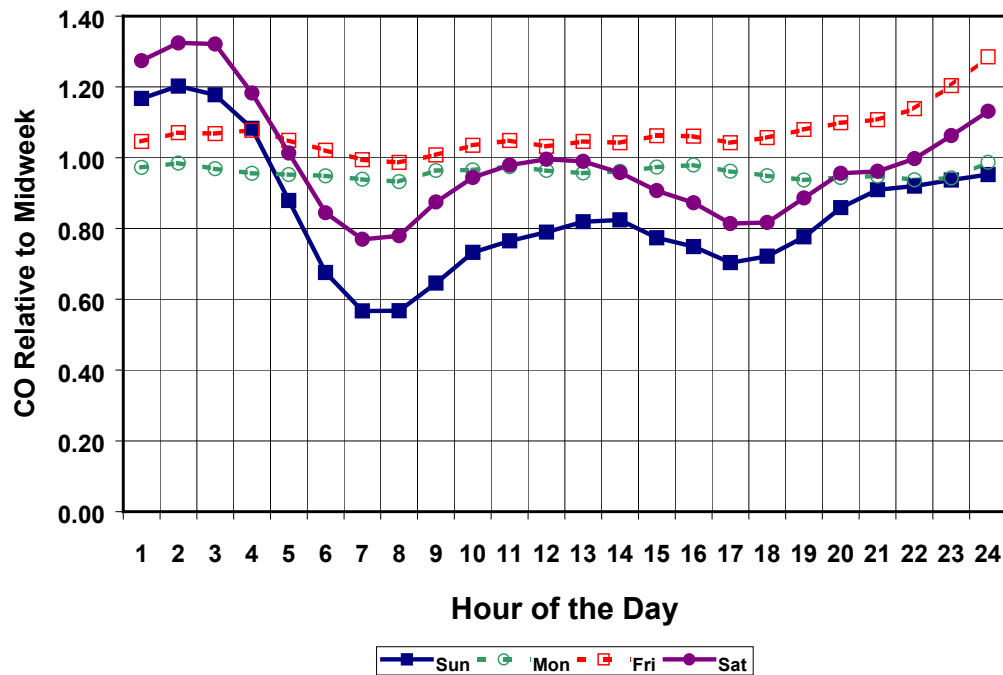
Traffic Domain	Sunday					
	6 - 8 a.m.			12 - 2 p.m.		
	Fwy Traffic	CO	NOx	Fwy Traffic	CO	NOx
Anaheim	0.26	0.57	0.41	0.96	0.87	0.65
Azusa	0.24	0.70	0.53	0.97	0.79	0.54
Burbank	0.24	0.73	0.50	0.93	0.74	0.55
Hawthorne	0.30	0.60	0.52	0.93	0.88	0.66
Irvine (El Toro)	0.24	0.36	n/a	0.92	0.74	n/a
L.A. - CBD (N. Main)	0.28	0.61	0.46	0.97	0.79	0.54
Lynwood	0.34	0.50	0.46	0.94	0.98	0.76
N. Long Beach	0.24	0.58	0.48	0.78	0.72	0.60
Pico Rivera	0.26	0.69	0.48	0.98	0.80	0.50
Pomona	0.27	0.66	0.51	1.02	0.84	0.59
Reseda	0.27	0.64	0.54	0.98	0.73	0.56
Average	0.27	0.60	0.49	0.94	0.81	0.60

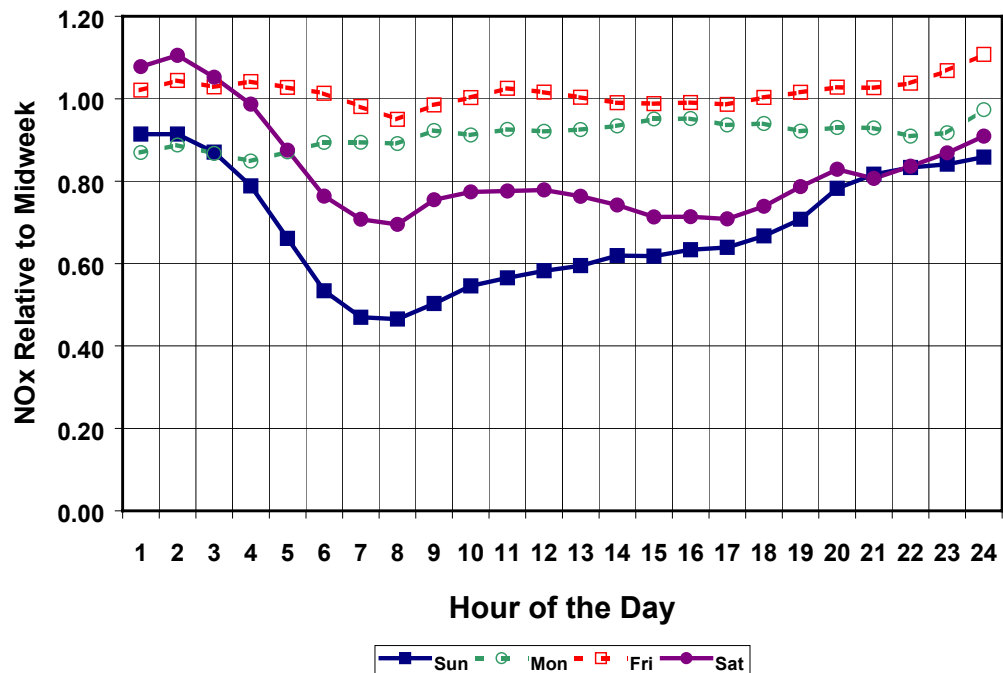
Traffic Domain (A.Q. Site if different)	Saturday					
	6 - 8 a.m.			12 - 2 p.m.		
	Fwy Traffic	CO	NOx	Fwy Traffic	CO	NOx
Anaheim	0.50	0.76	0.68	1.05	0.95	0.81
Azusa	0.43	0.91	0.81	1.05	0.98	0.75
Burbank	0.44	0.89	0.75	1.04	0.89	0.74
Hawthorne	0.49	0.72	0.68	1.03	0.96	0.78
Irvine (El Toro)	0.44	0.66	n/a	1.05	1.06	n/a
L.A. - CBD (N. Main)	0.51	0.82	0.72	1.05	0.98	0.75
Lynwood	0.56	0.71	0.70	1.06	1.22	0.91
N. Long Beach	0.43	0.77	0.66	0.90	0.93	0.71
Pico Rivera	0.52	0.87	0.75	1.06	0.95	0.68
Pomona	0.46	0.86	0.77	1.09	0.98	0.77
Reseda	0.46	0.82	0.71	1.06	0.86	0.71
Average	0.48	0.80	0.72	1.04	0.98	0.76

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**Figure 5.3-1 Hourly values of CO by day-of-week expressed as a percent of the midweek hourly value; composite of results for 11 sub-regions of the South Coast Air Basin**



**Figure 5.3-2 Hourly values of NO<sub>x</sub> by day-of-week expressed as a percent of the midweek hourly value; composite of results for 11 sub-regions of the South Coast Air Basin**





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Figure 5.3-3 Pseudo “VOC/NO<sub>x</sub>” ratio by day-of-week expressed as percent of the midweek value; composite of 11 sub-regions of the South Coast Air Basin

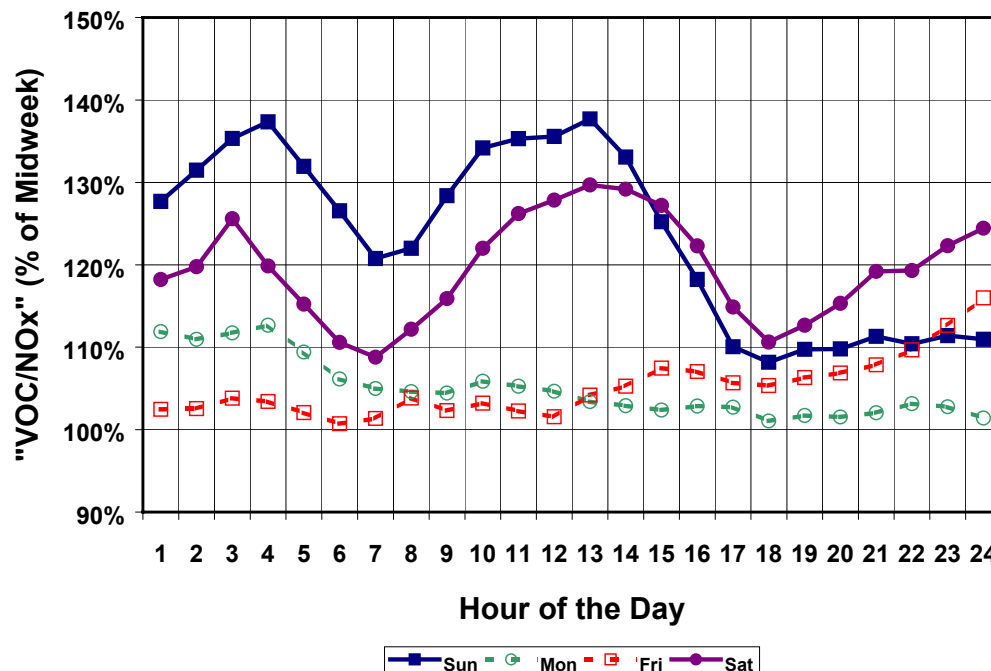
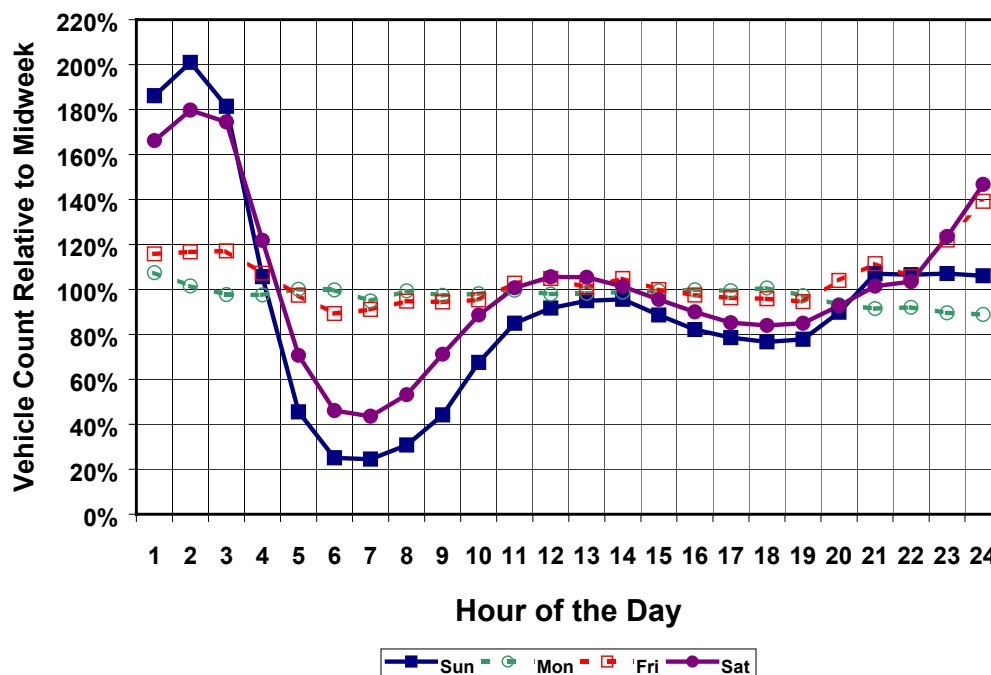
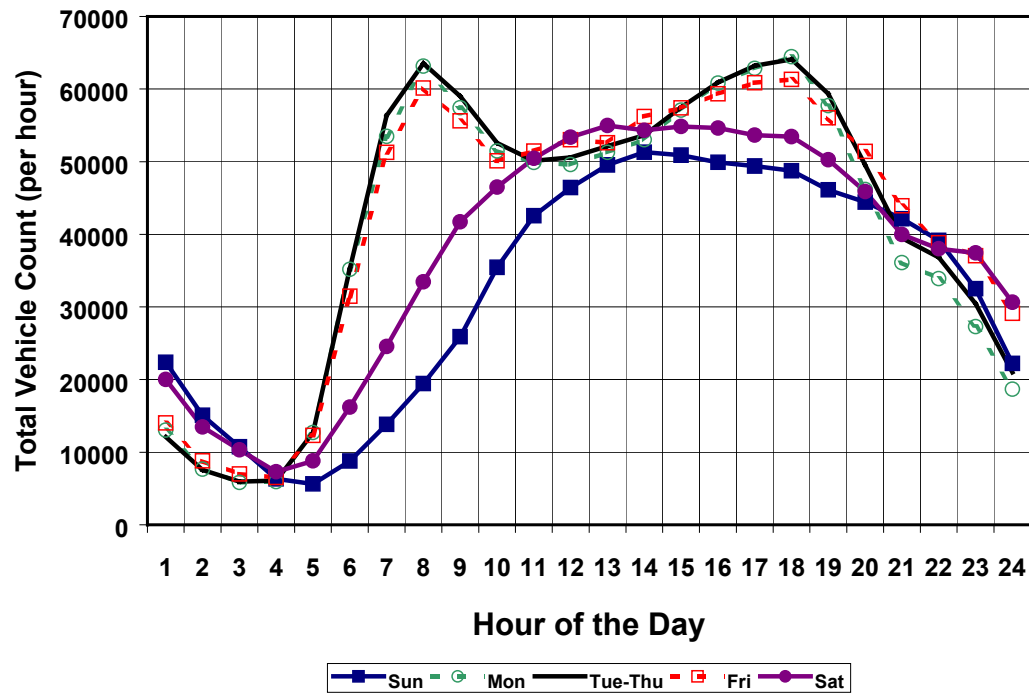


Figure 5.3-4 Freeway traffic by day-of-week expressed as percent of the midweek value; composite of results for 11 sub-regions of the South Coast Air Basin



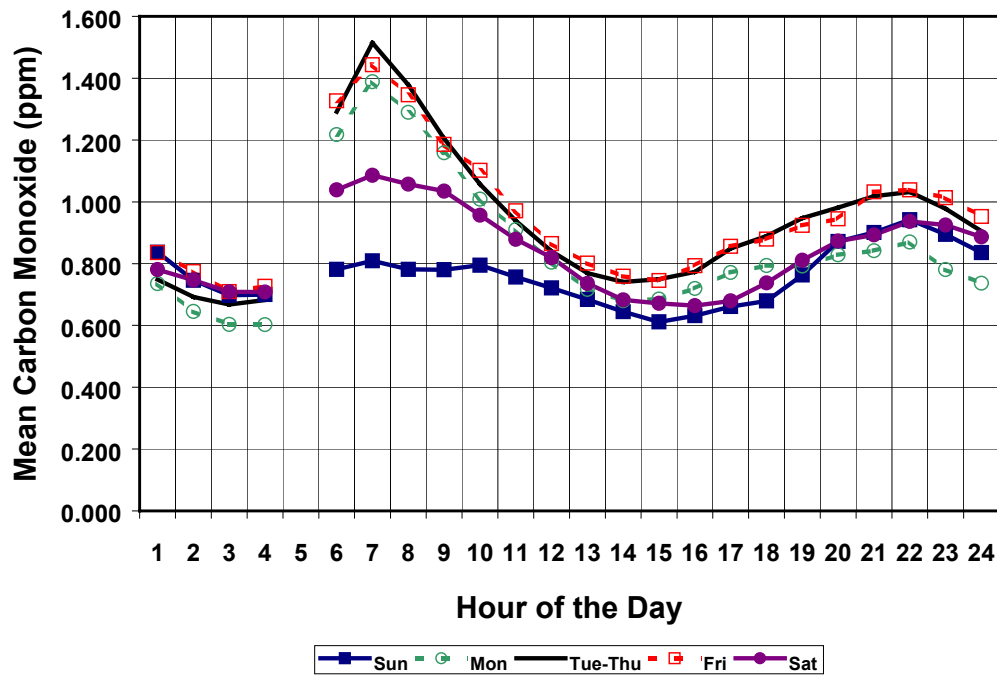
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**Figure 5.3-5 Freeway traffic by day-of-week normalized to a midweek daily total of one million vehicles; composite of 11 sub-regions of the South Coast Air Basin**

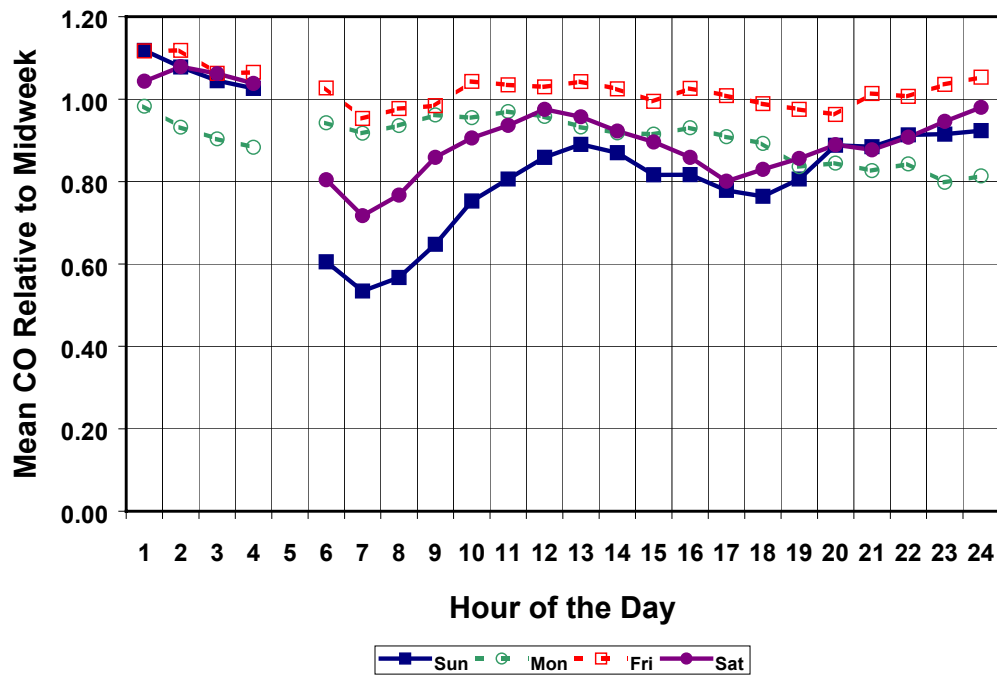


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**Figure 5.3-6 Carbon monoxide profiles by day of week at Anaheim, based on data for the May – October ozone seasons of 1996-1998.**

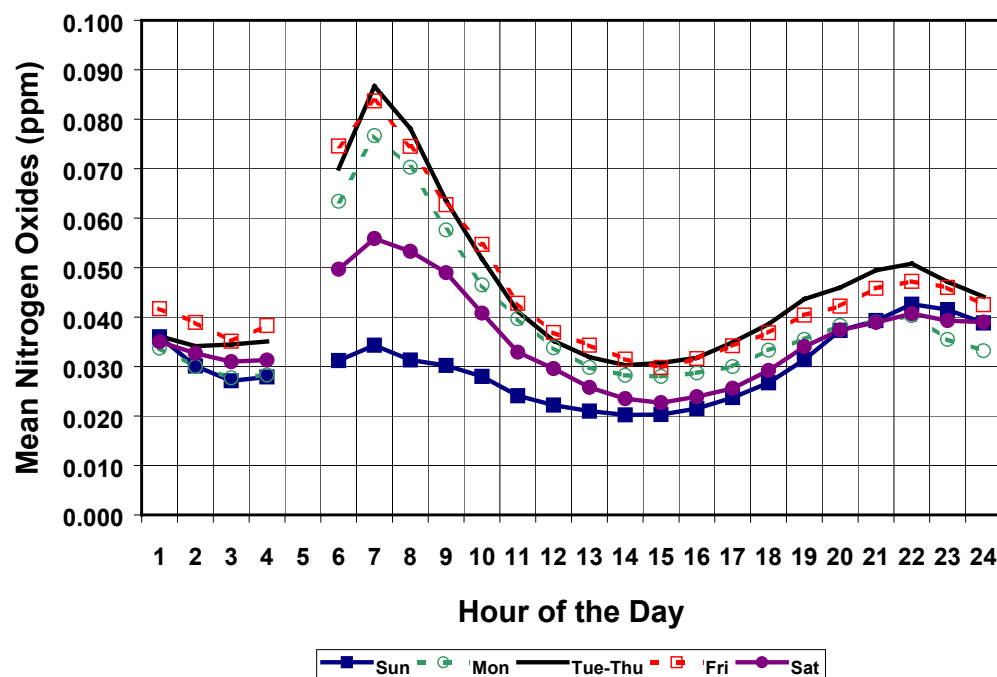


**Figure 5.3-7 Carbon monoxide profiles for Anaheim, expressed as a proportion of the midweek values.**

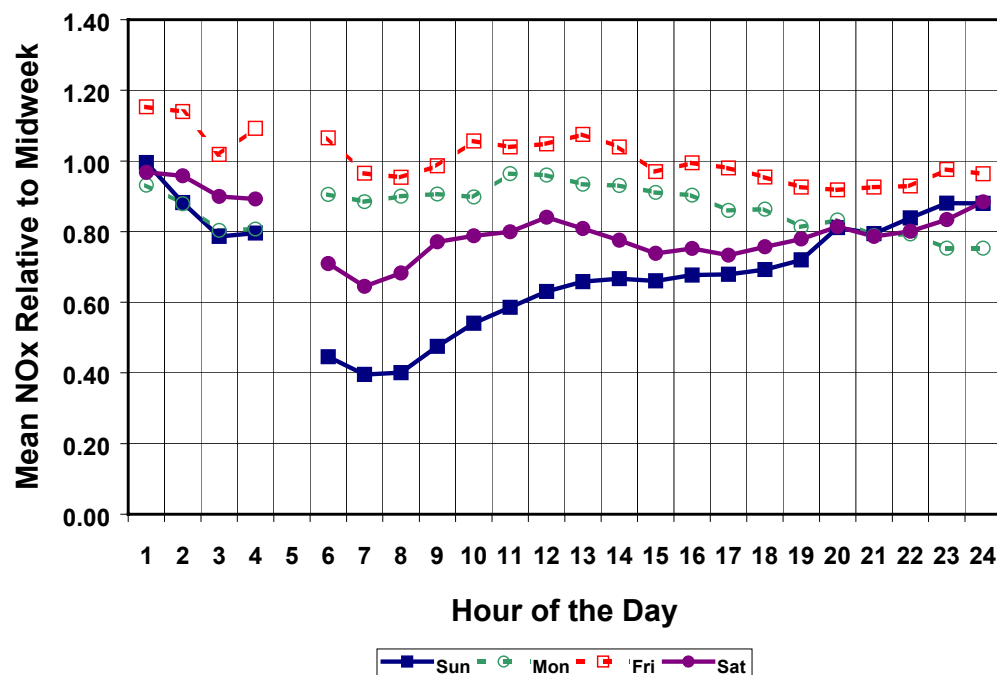


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**Figure 5.3-8 Nitrogen oxides profiles by day of week at Anaheim, based on data for the May – October ozone seasons of 1996-1998.**

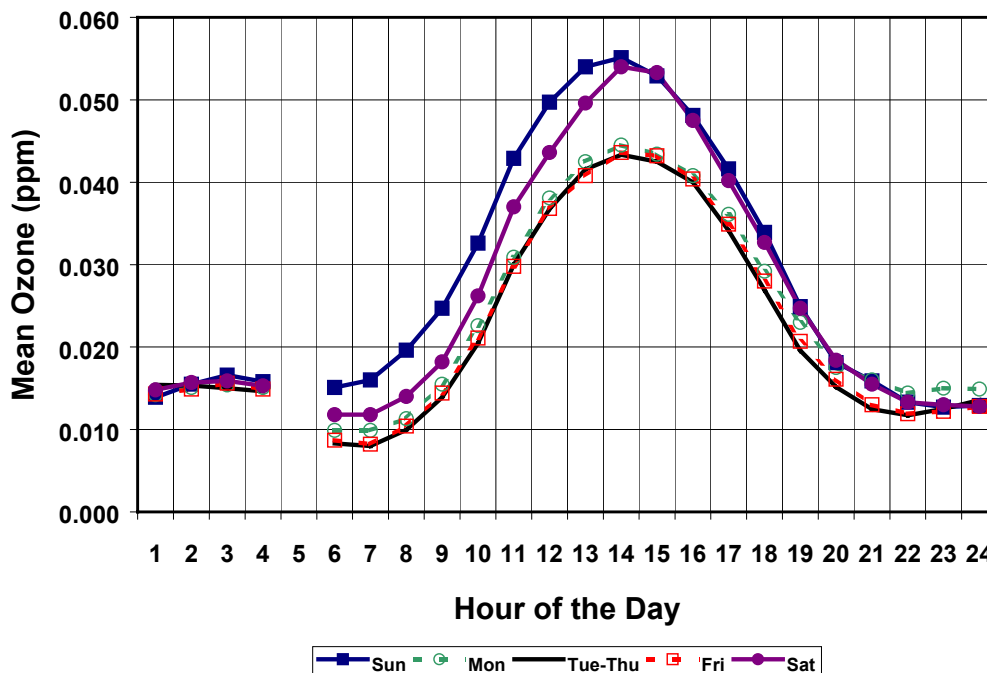


**Figure 5.3-9 Nitrogen oxides profiles for Anaheim, expressed as a proportion of the midweek values.**

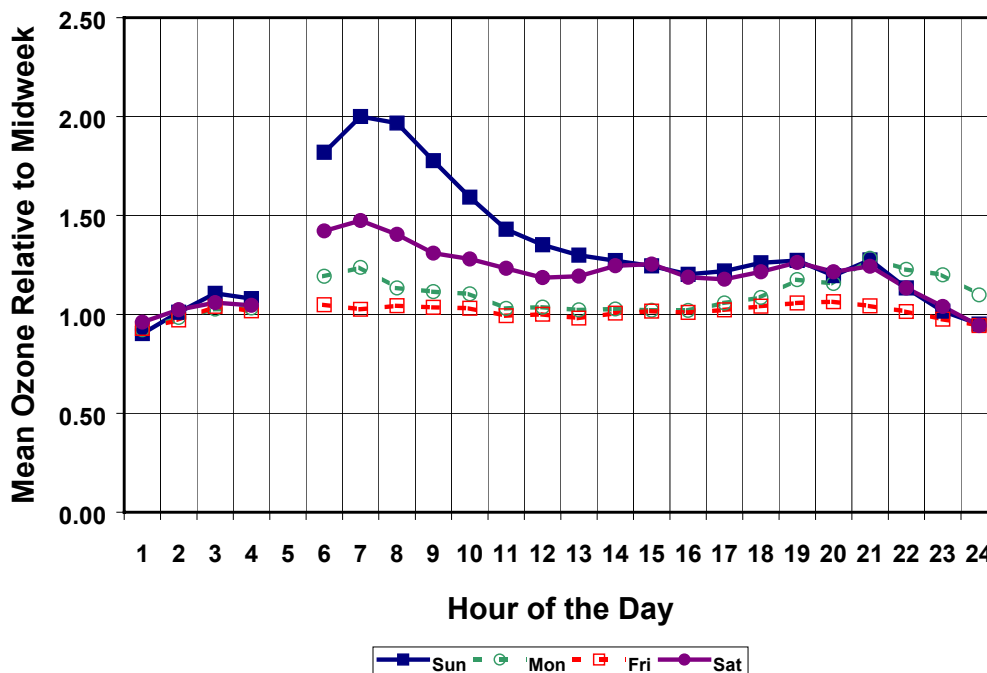


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**Figure 5.3-10 Ozone profiles by day of week at Anaheim, based on data for the May – October ozone seasons of 1996-1998.**

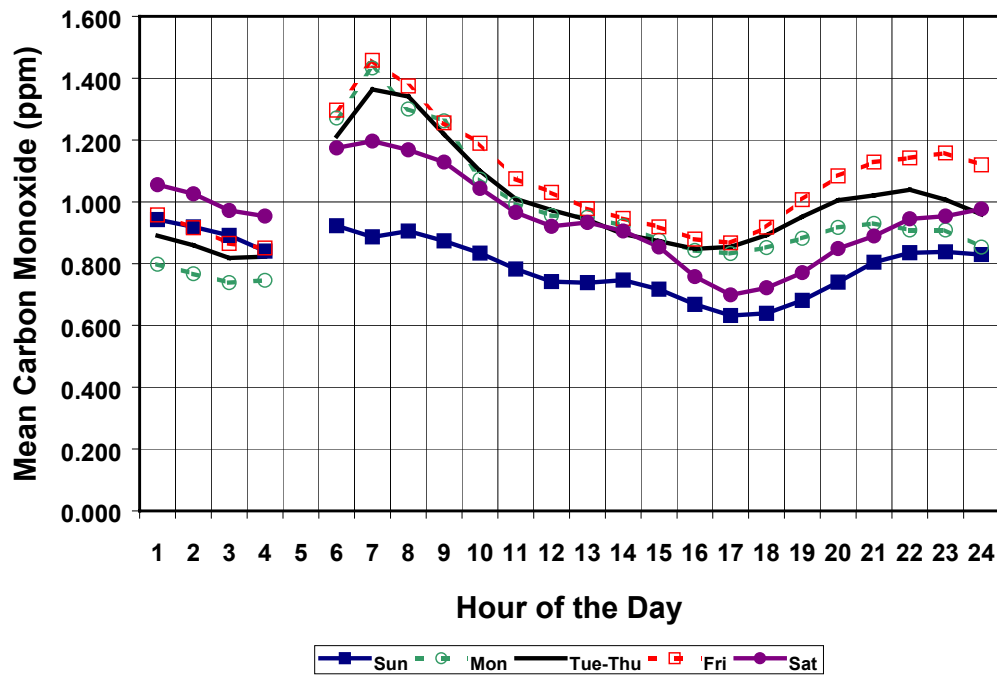


**Figure 5.3-11 Ozone profiles for Anaheim, expressed as a proportion of the midweek values.**

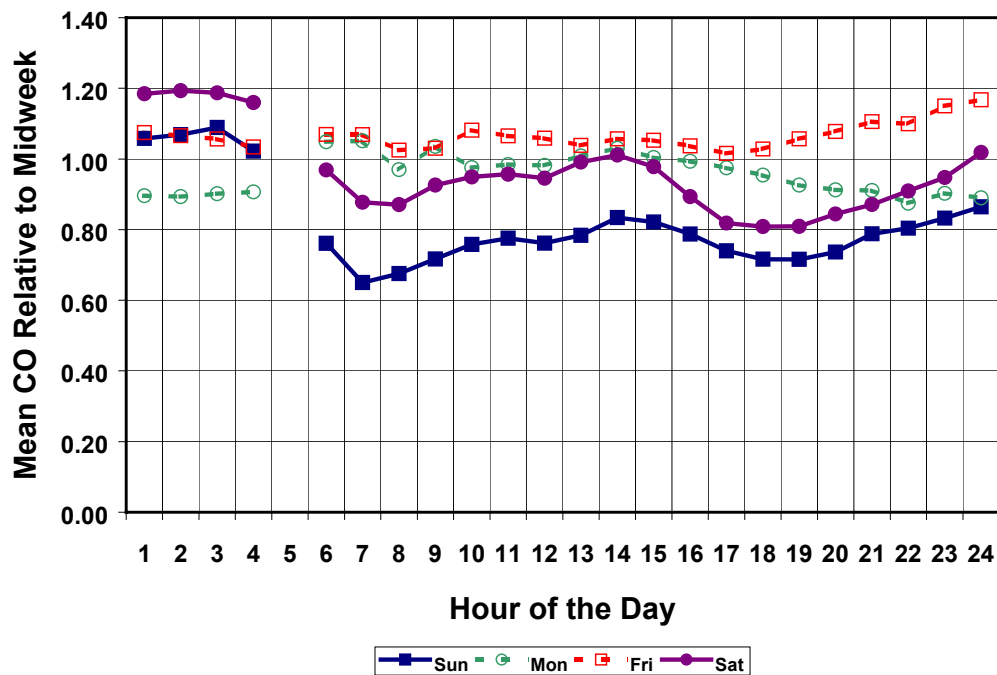


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**Figure 5.3-12 Carbon monoxide profiles by day of week at Azusa, based on data for the May – October ozone seasons of 1996-1998.**

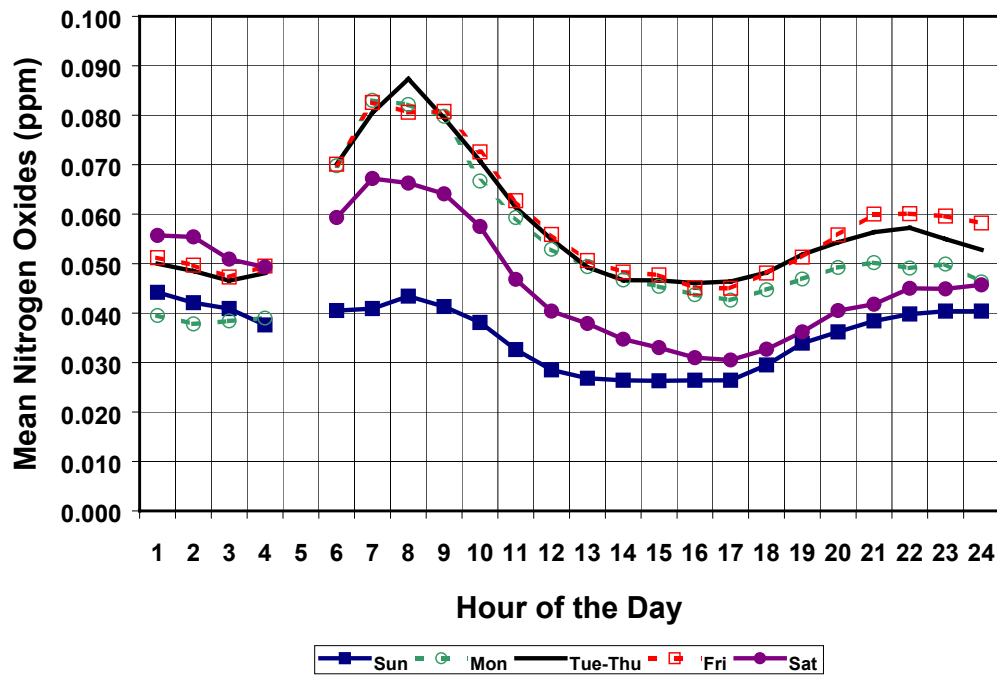


**Figure 5.3-13 Carbon monoxide profiles for Azusa, expressed as a proportion of the midweek values.**

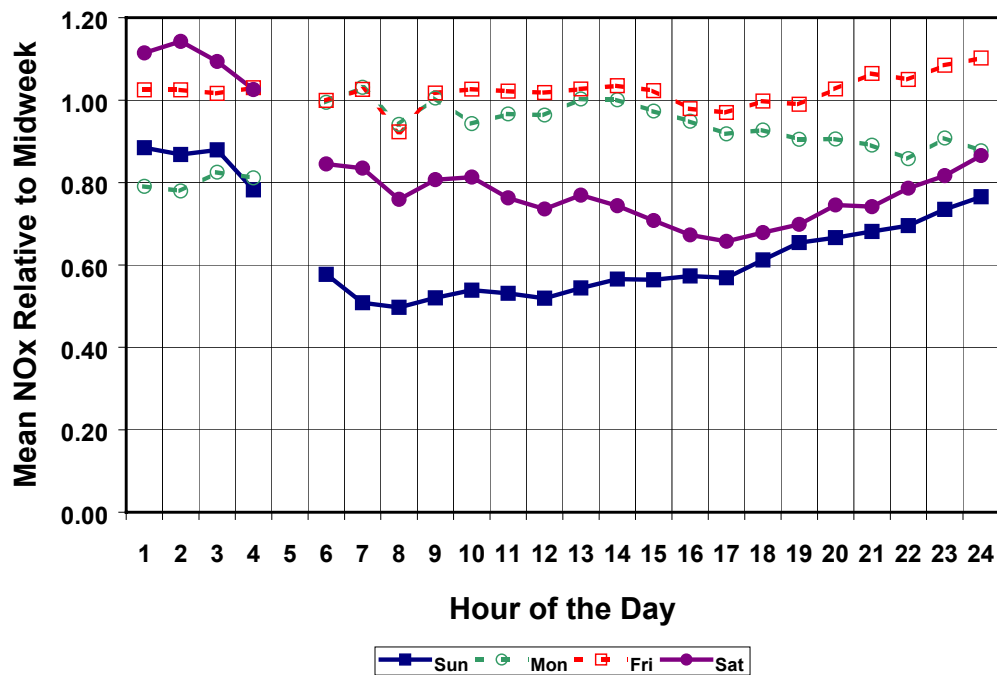


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**Figure 5.3-14 Nitrogen oxides profiles by day of week at Azusa, based on data for the May – October ozone seasons of 1996-1998.**

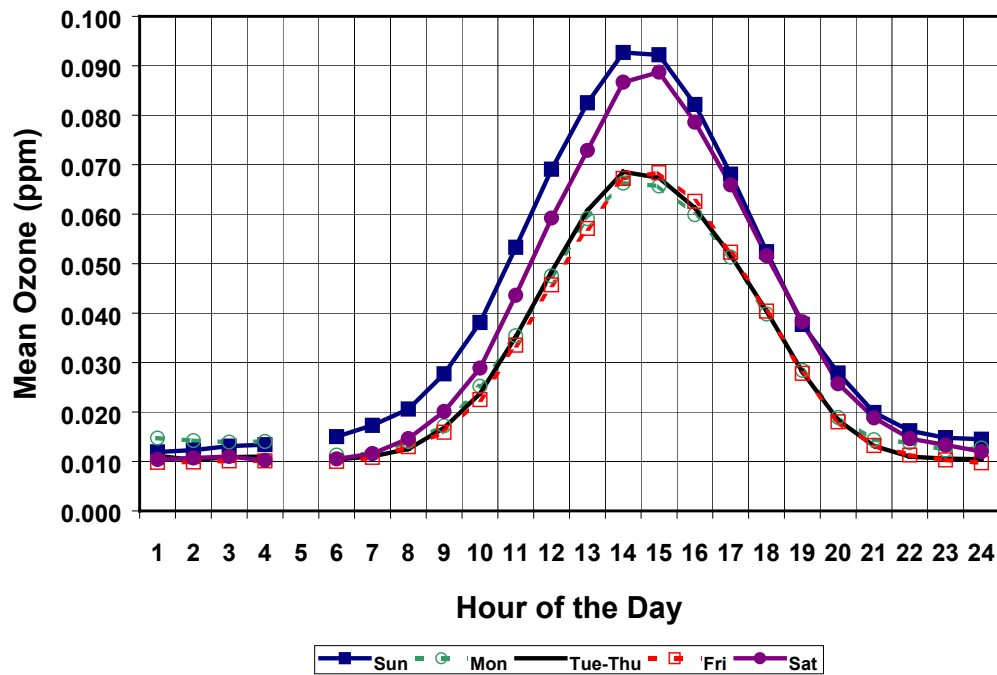


**Figure 5.3-15 Nitrogen oxides profiles for Azusa, expressed as a proportion of the midweek values.**

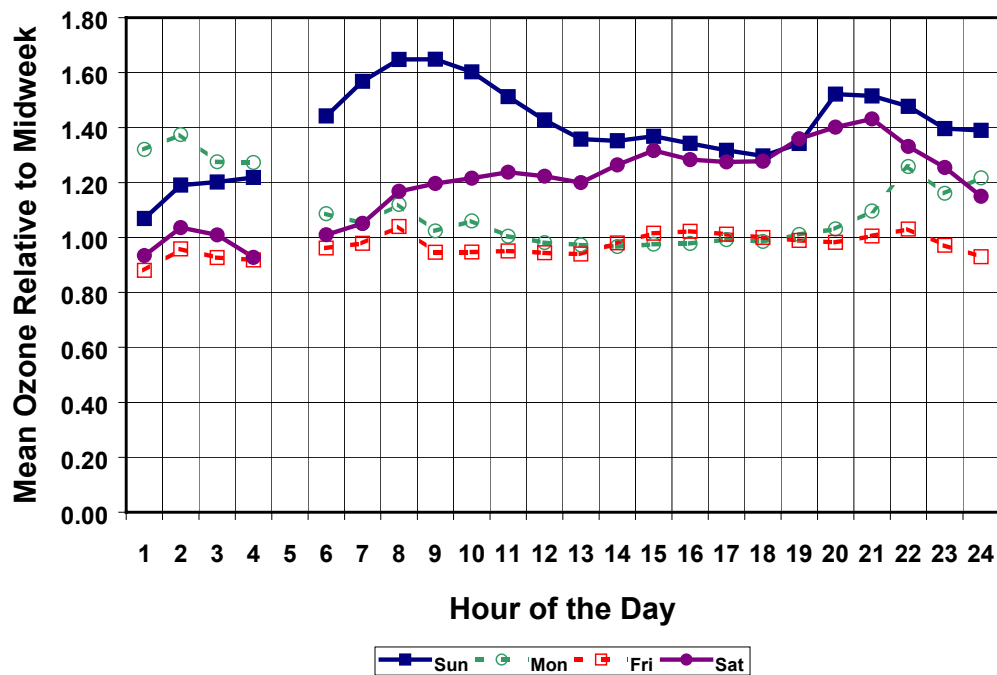


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**Figure 5.3-16 Ozone profiles by day of week at Azusa, based on data for the May – October ozone seasons of 1996-1998.**



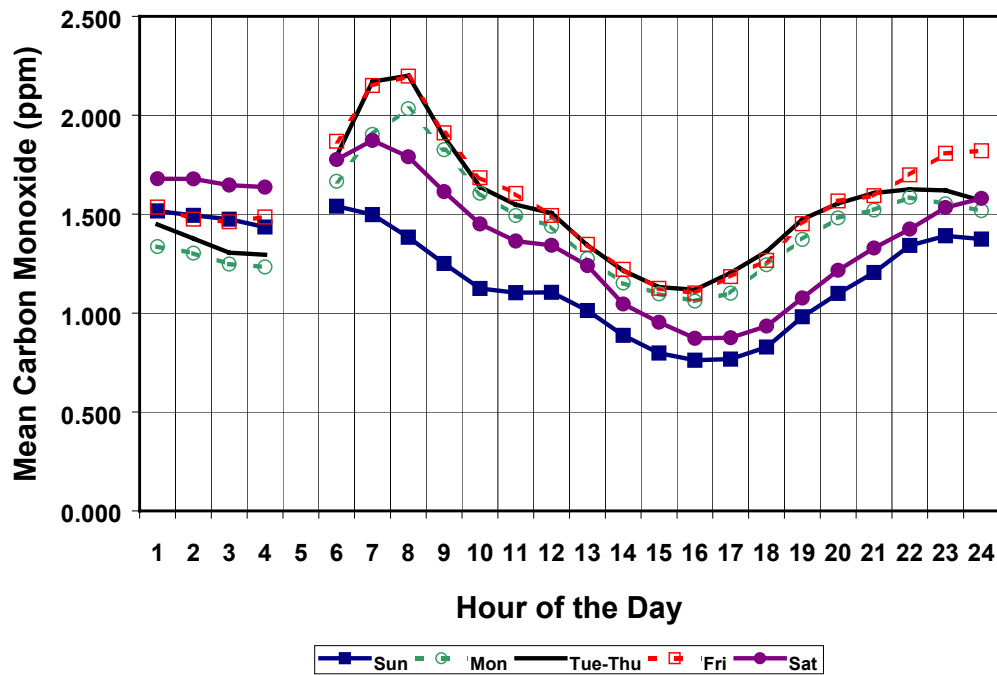
**Figure 5.3-17 Ozone profiles for Azusa, expressed as a proportion of the midweek values.**



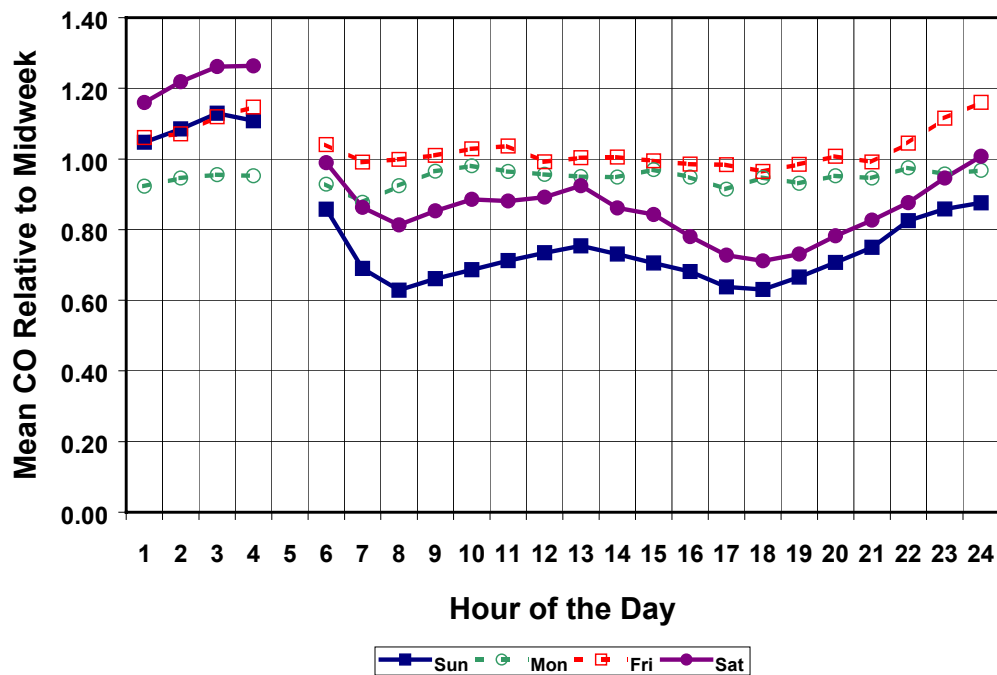


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**Figure 5.3-18 Carbon monoxide profiles by day of week at Burbank, based on data for the May – October ozone seasons of 1996-1998.**

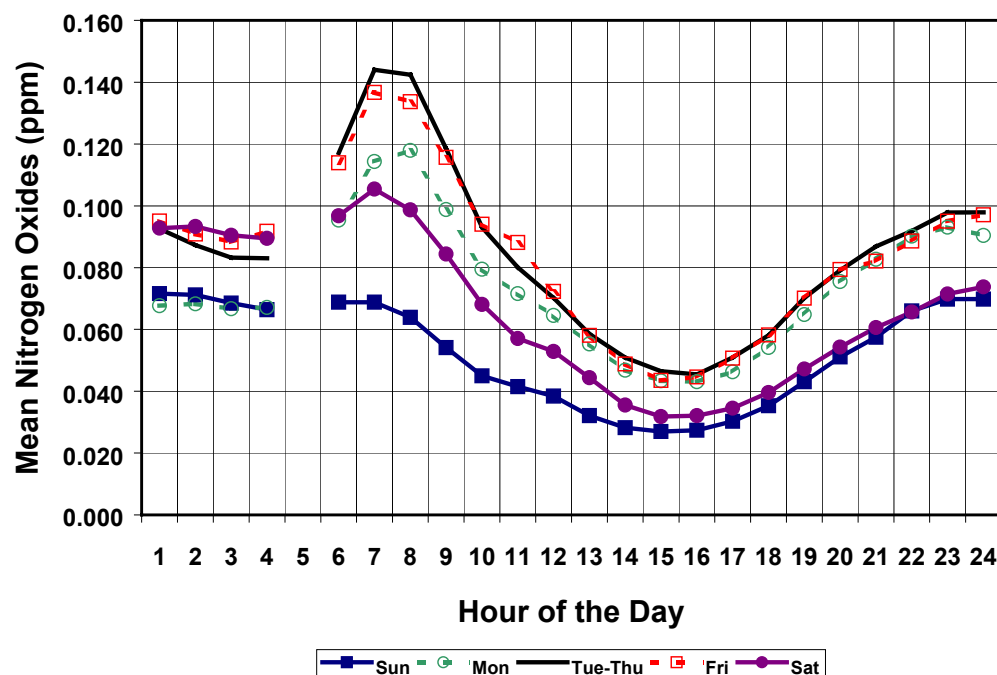


**Figure 5.3-19 Carbon monoxide profiles for Burbank, expressed as a proportion of the midweek values.**

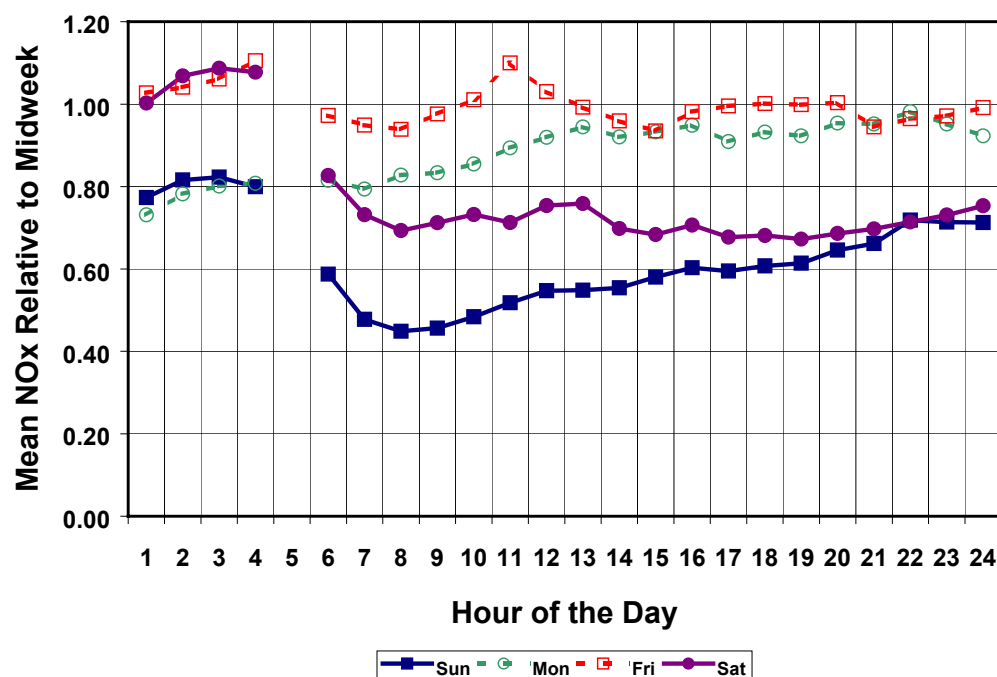


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**Figure 5.3-20 Nitrogen oxides profiles by day of week at Burbank, based on data for the May – October ozone seasons of 1996-1998.**

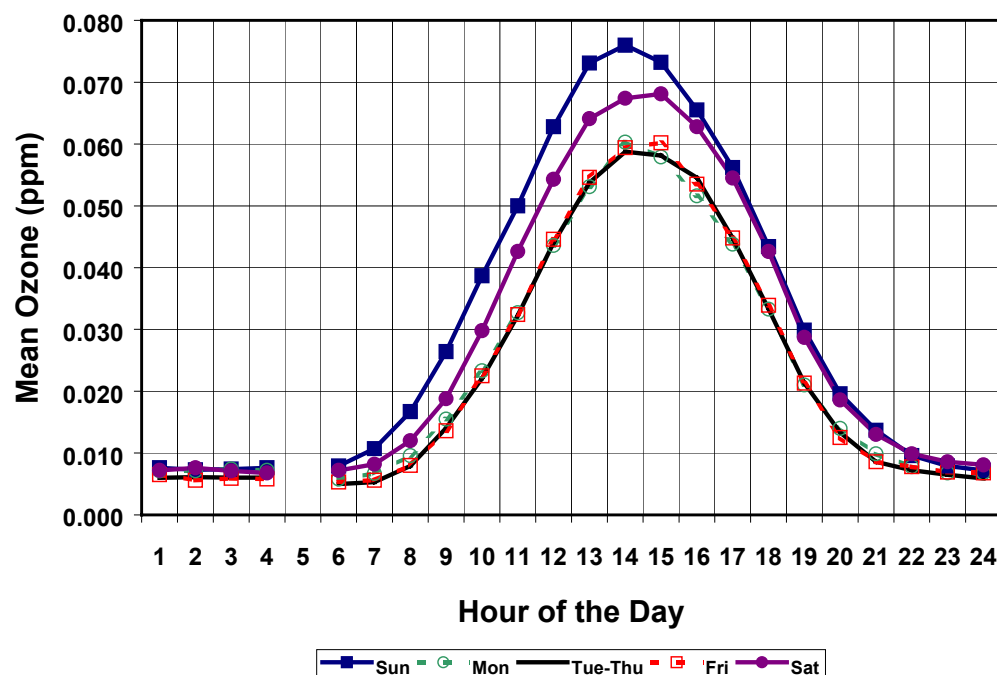


**Figure 5.3-21 Nitrogen oxides profiles for Burbank, expressed as a proportion of the midweek values.**

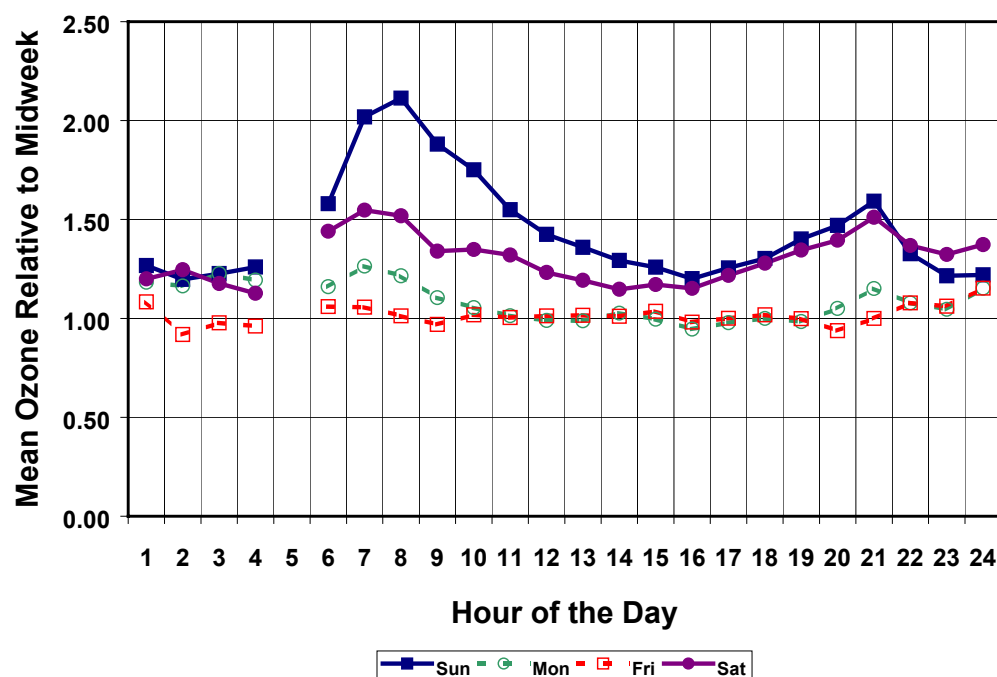


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**Figure 5.3-22 Ozone profiles by day of week at Burbank, based on data for the May – October ozone seasons of 1996-1998.**

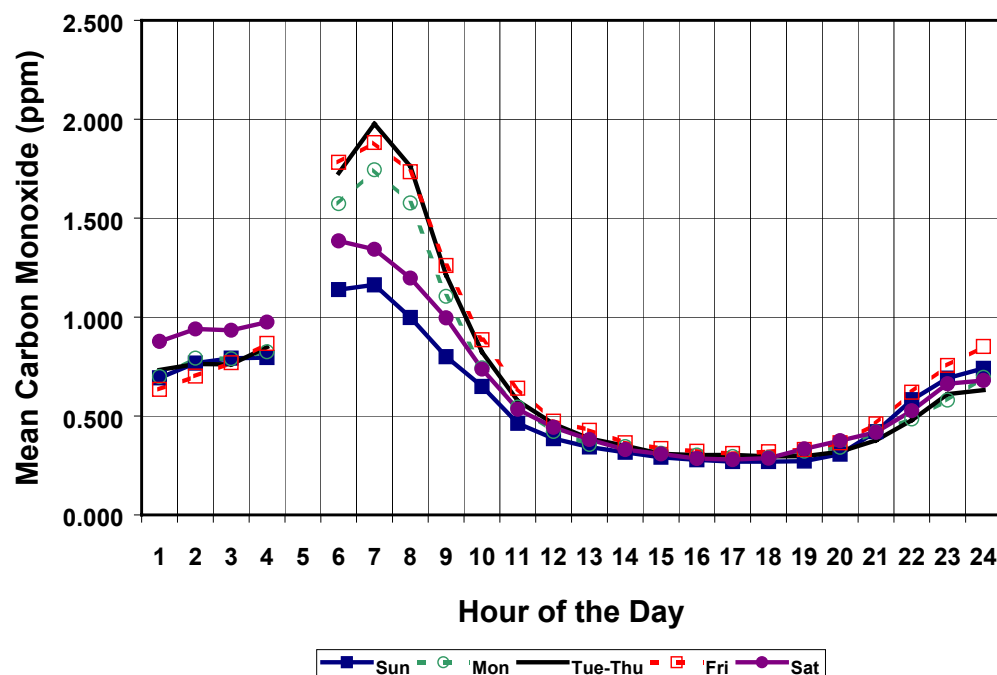


**Figure 5.3-23 Ozone profiles for Burbank, expressed as a proportion of the midweek values.**

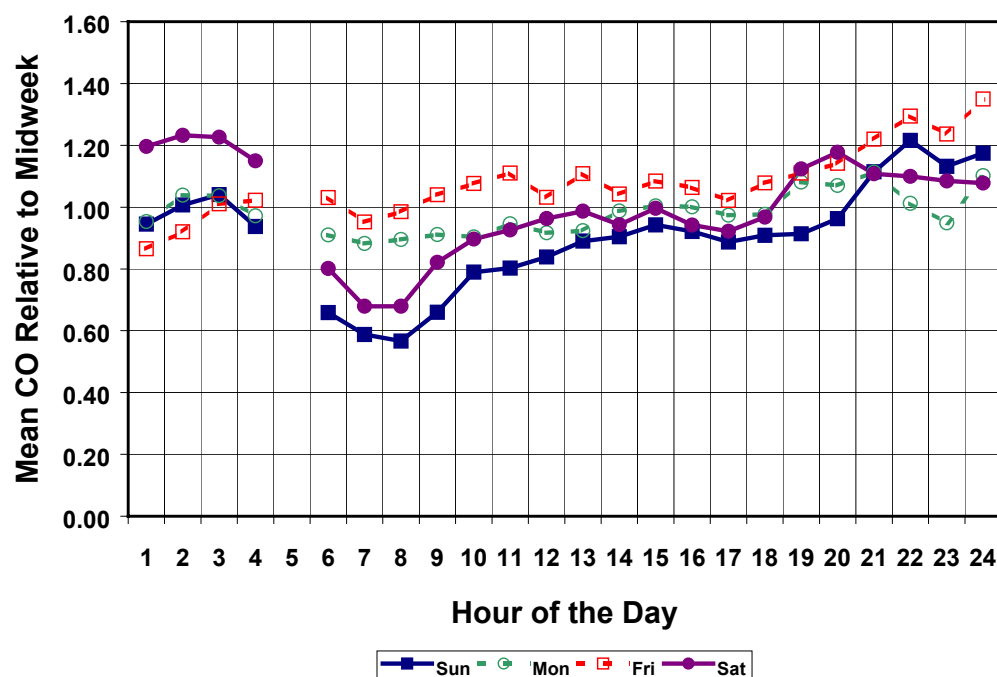


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**Figure 5.3-24 Carbon monoxide profiles by day of week at Hawthorne, based on data for the May – October ozone seasons of 1996-1998.**

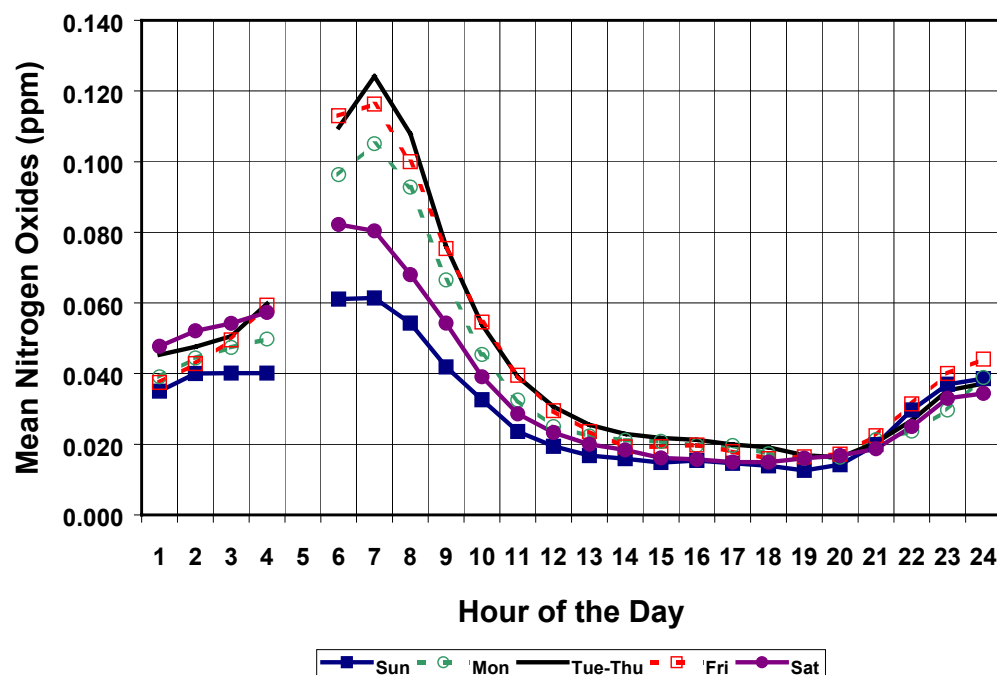


**Figure 5.3-25 Carbon monoxide profiles for Hawthorne, expressed as a proportion of the midweek values.**

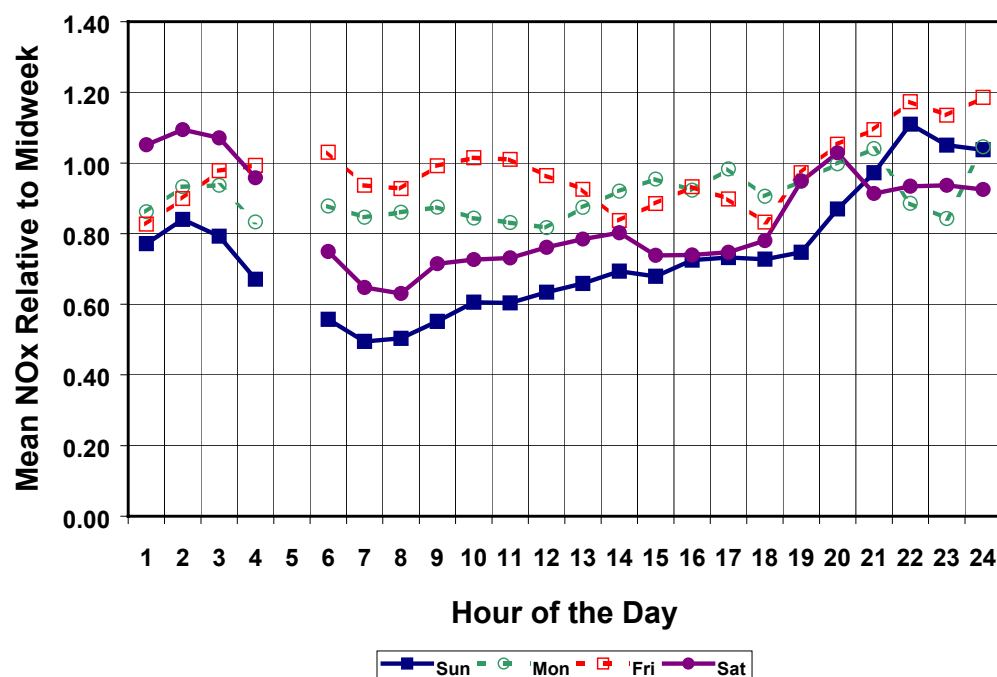


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**Figure 5.3-26 Nitrogen oxides profiles by day of week at Hawthorne, based on data for the May – October ozone seasons of 1996-1998.**

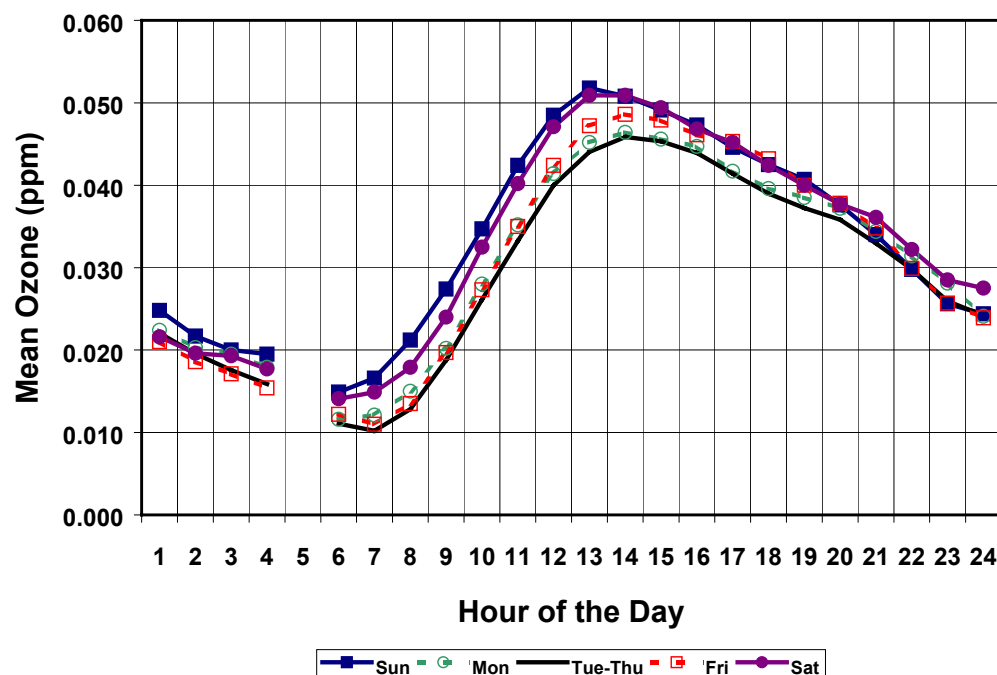


**Figure 5.3-27 Nitrogen oxides profiles for Hawthorne, expressed as a proportion of the midweek values.**

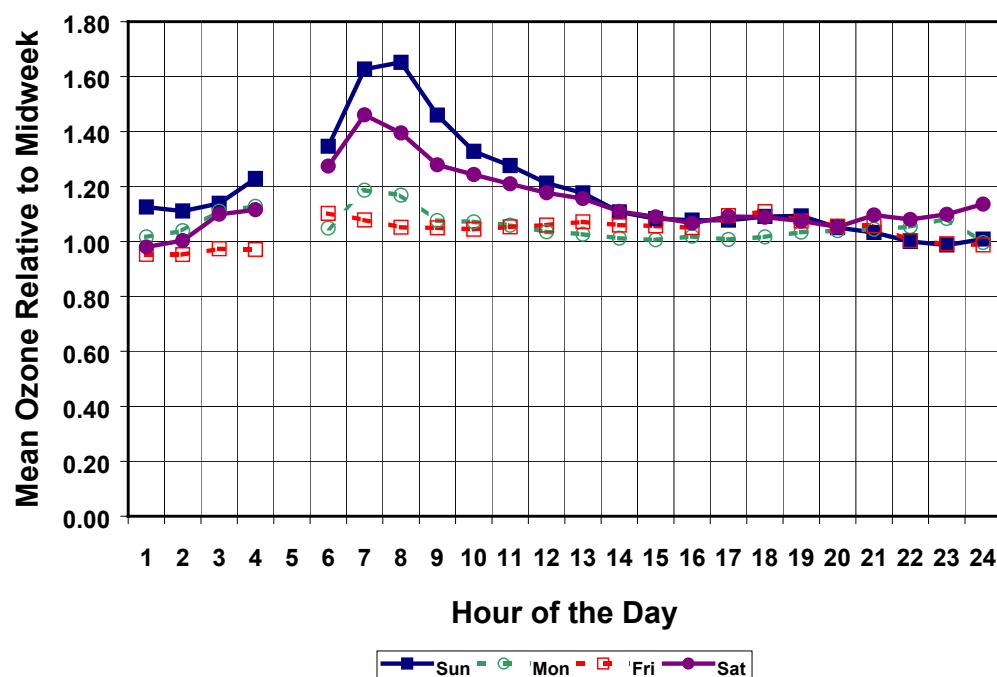


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**Figure 5.3-28 Ozone profiles by day of week at Hawthorne, based on data for the May – October ozone seasons of 1996-1998.**



**Figure 5.3-29 Ozone profiles for Hawthorne, expressed as a proportion of the midweek values.**



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Figure 5.3-30 Carbon monoxide profiles by day of week at Irvine (El Toro), based on data for the May – October ozone seasons of 1996-1998.

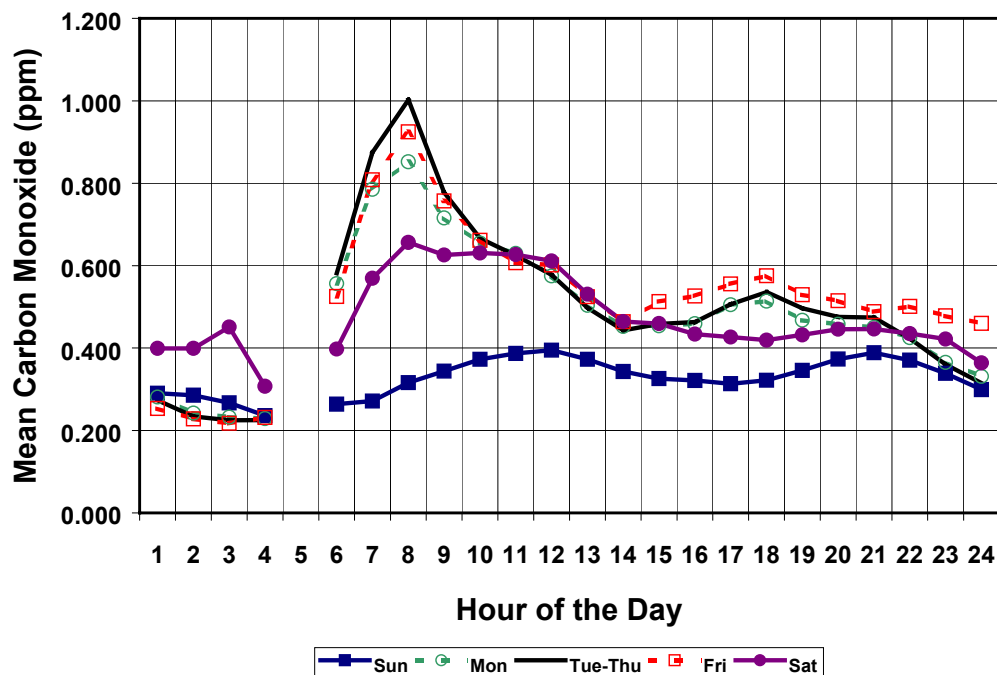
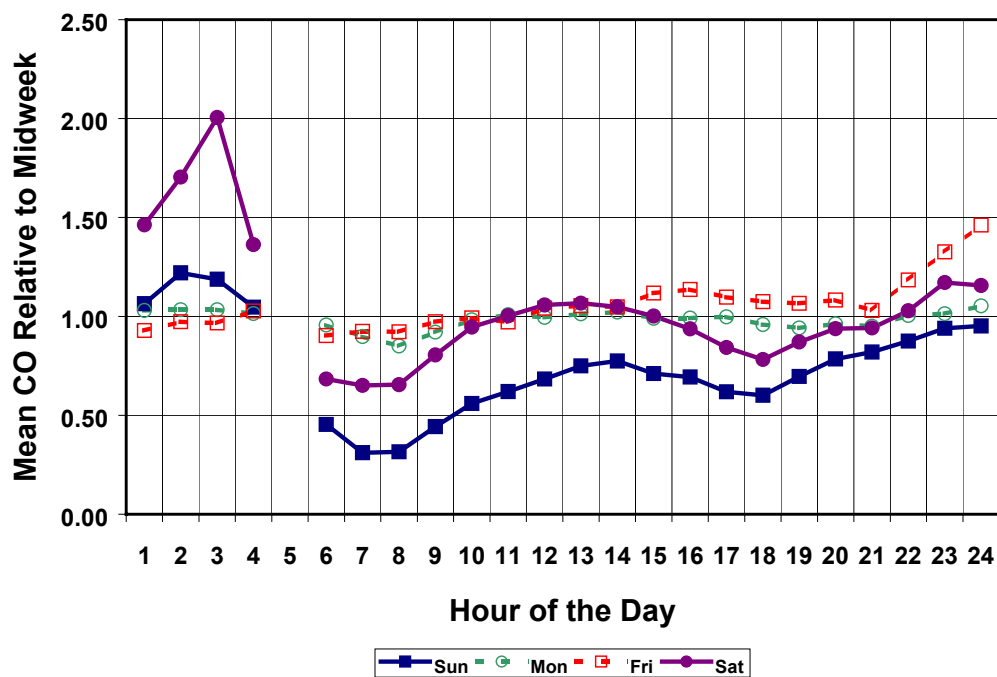
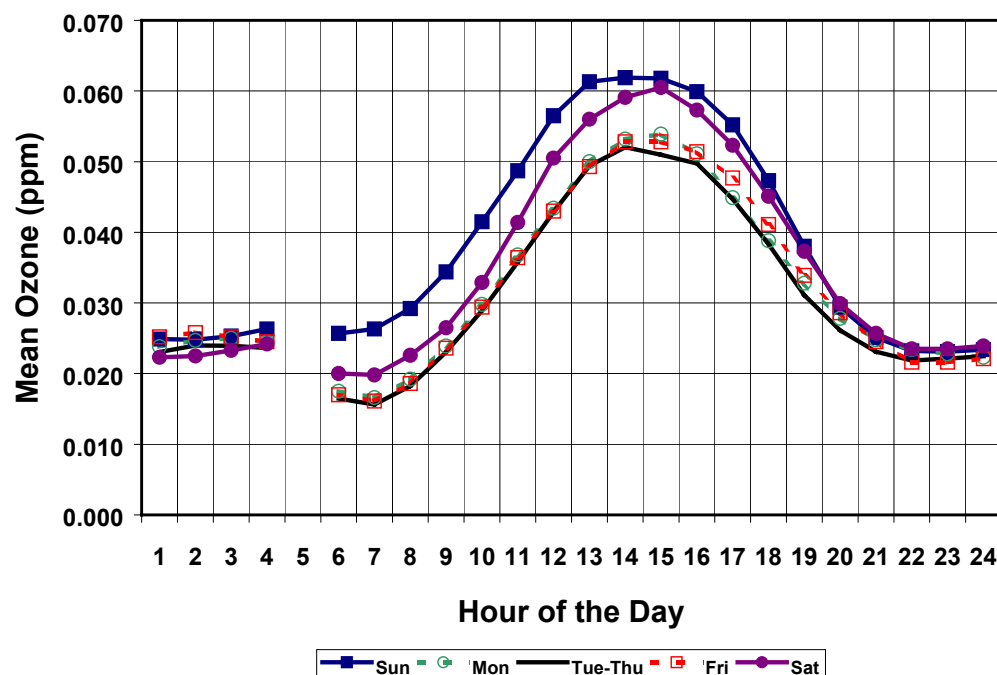


Figure 5.3-31 Carbon monoxide profiles for Irvine (El Toro), expressed as a proportion of the midweek values.

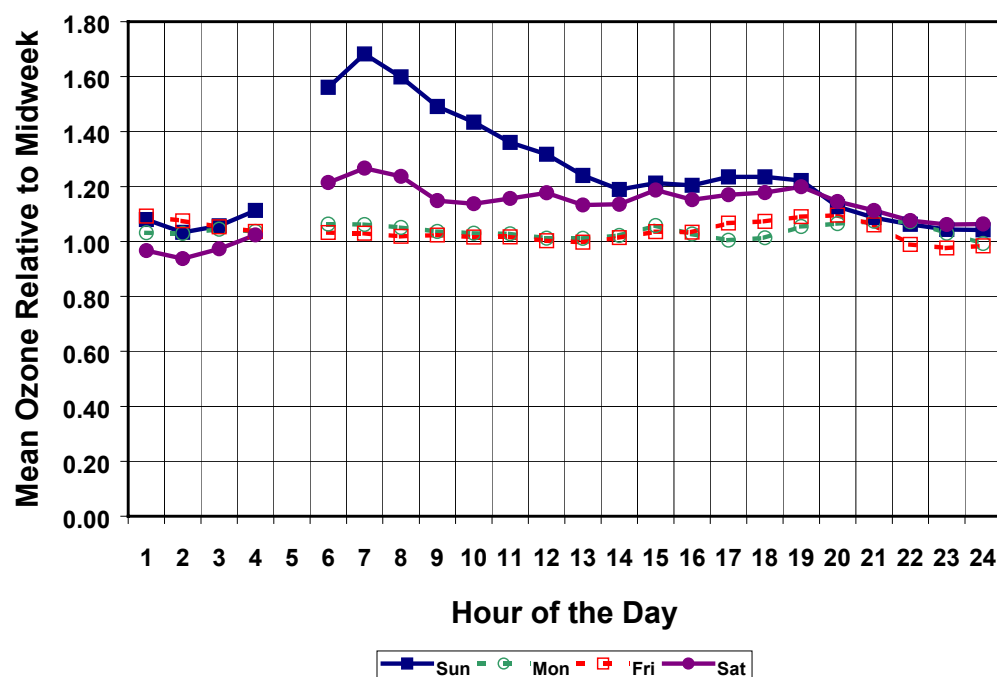


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**Figure 5.3-32 Ozone profiles by day of week at Irvine (El Toro), based on data for the May – October ozone seasons of 1996-1998.**



**Figure 5.3-33 Ozone profiles for Irvine (El Toro), expressed as a proportion of the midweek values.**





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Figure 5.3-34 Carbon monoxide profiles by day of week at L.A. – N. Main, based on data for the May – October ozone seasons of 1996-1998.

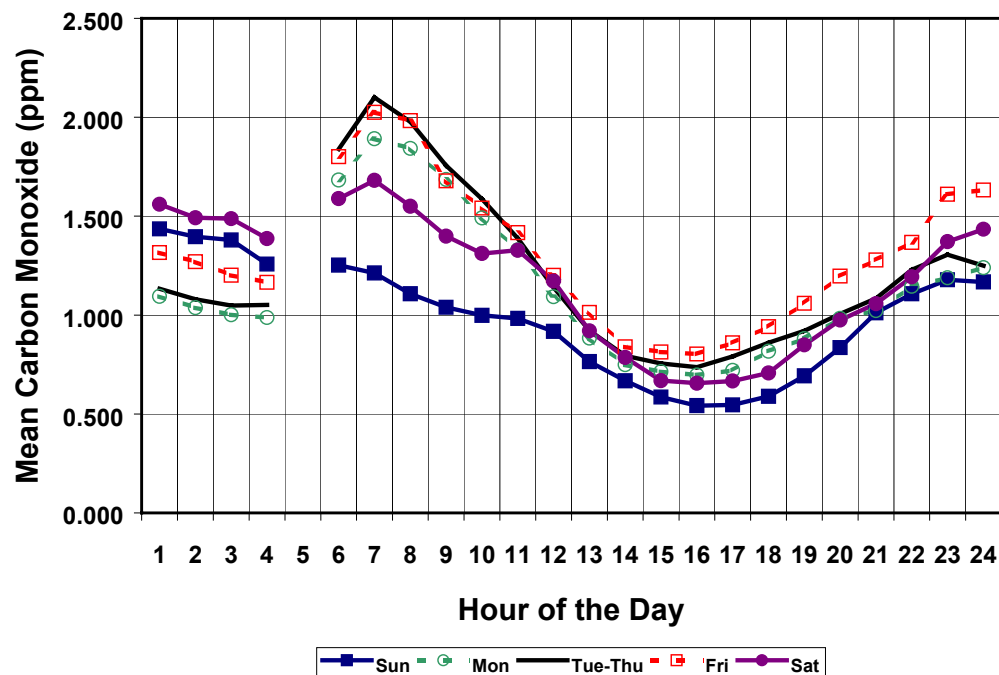
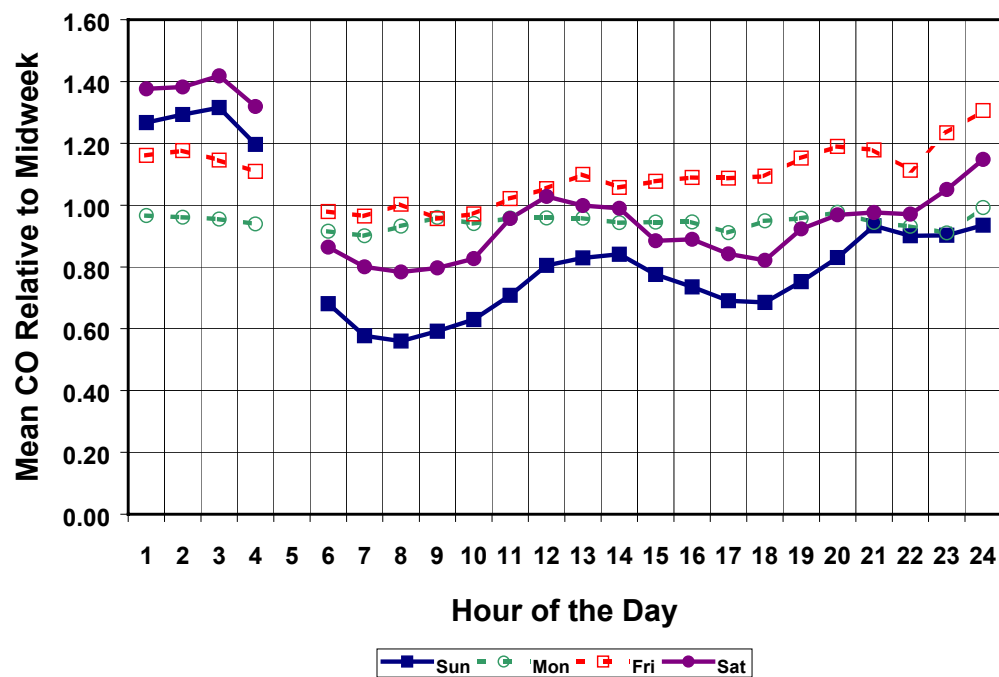
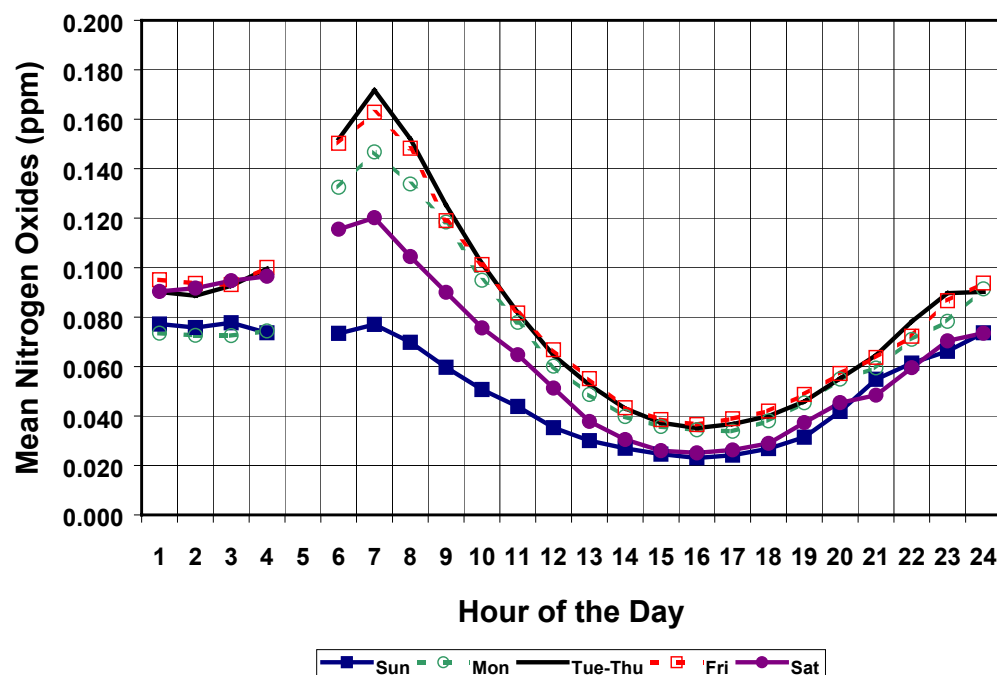


Figure 5.3-35 Carbon monoxide profiles for L.A. – N. Main, expressed as a proportion of the midweek values.

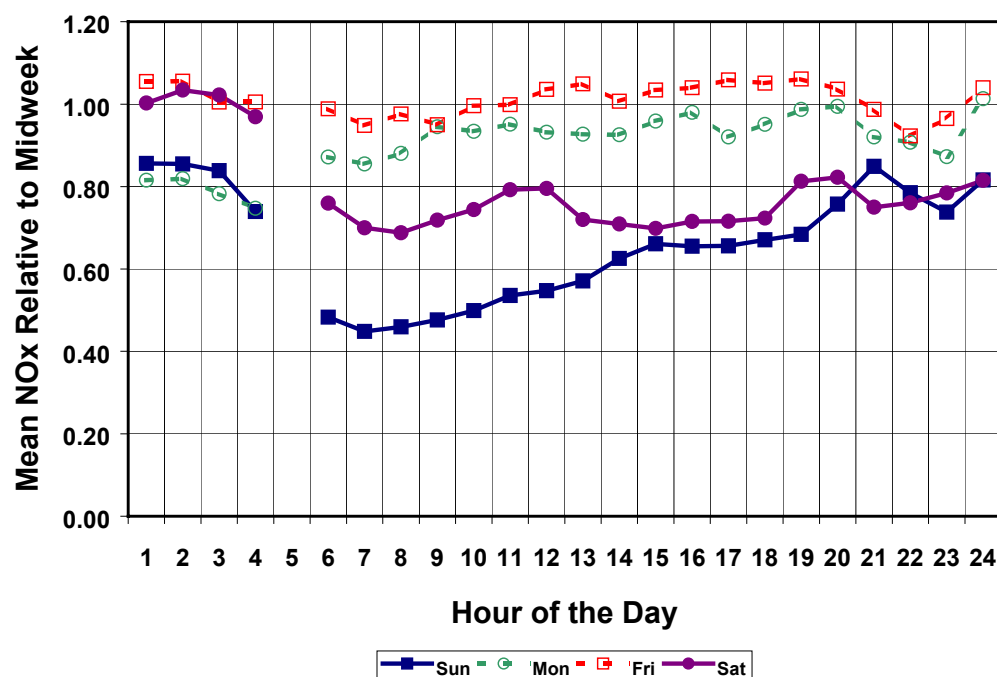


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**Figure 5.3-36 Nitrogen oxides profiles by day of week at L.A. – N. Main, based on data for the May – October ozone seasons of 1996-1998.**

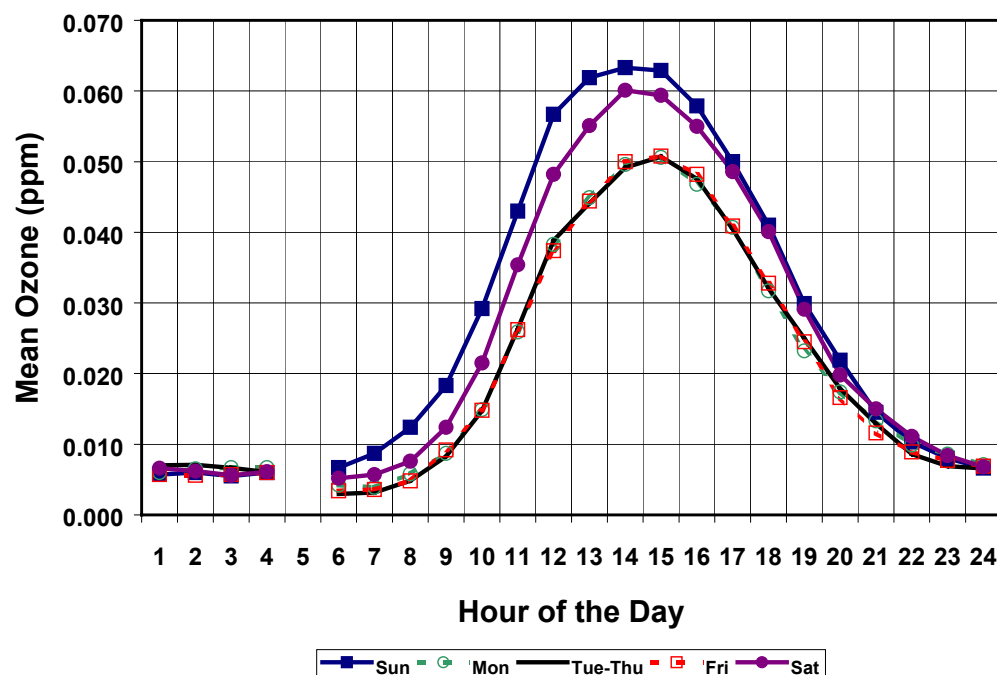


**Figure 5.3-37 Nitrogen oxides profiles for L.A. – N. Main, expressed as a proportion of the midweek values.**

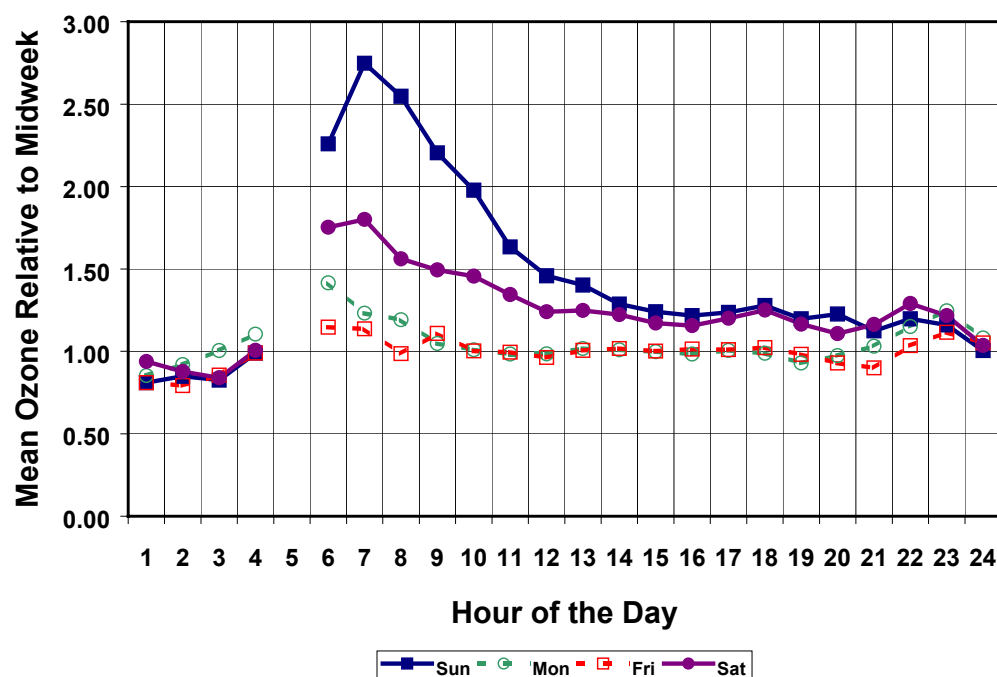


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**Figure 5.3-38 Ozone profiles by day of week at L.A. – N. Main, based on data for the May – October ozone seasons of 1996-1998.**

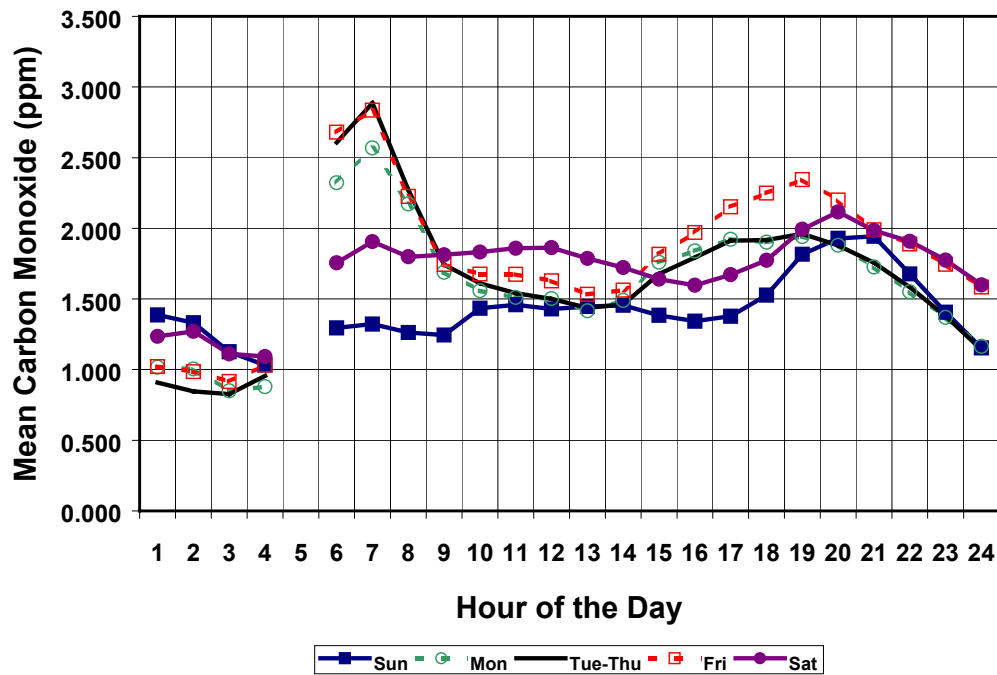


**Figure 5.3-39 Ozone profiles for L.A. – N. Main, expressed as a proportion of the midweek values.**

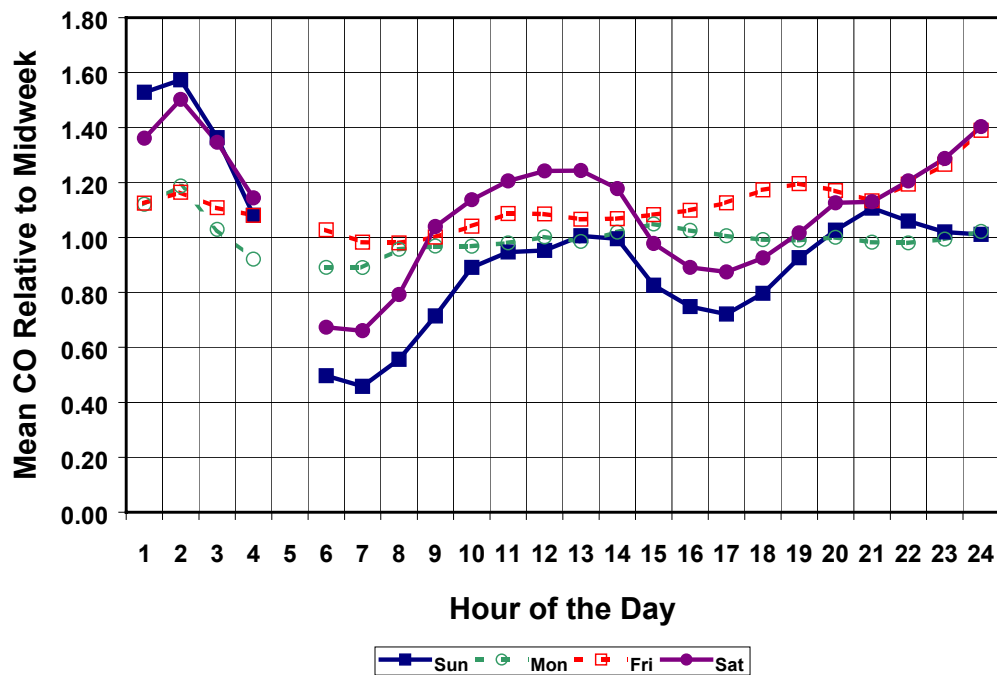


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**Figure 5.3-40 Carbon monoxide profiles by day of week at Lynwood, based on data for the May – October ozone seasons of 1996-1998.**

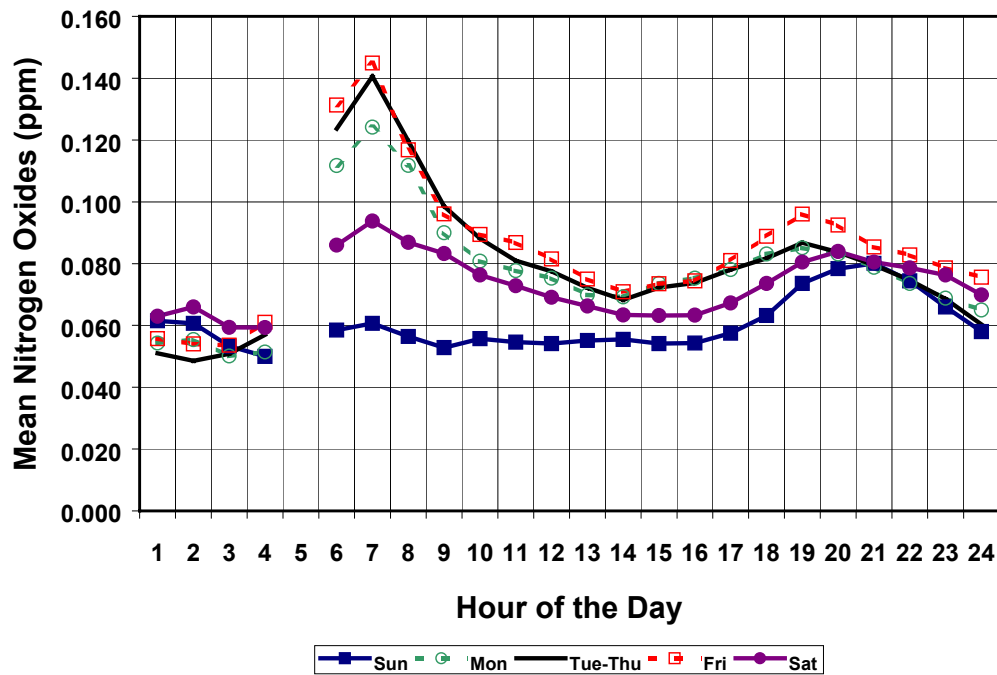


**Figure 5.3-41 Carbon monoxide profiles for Lynwood, expressed as a proportion of the midweek values.**

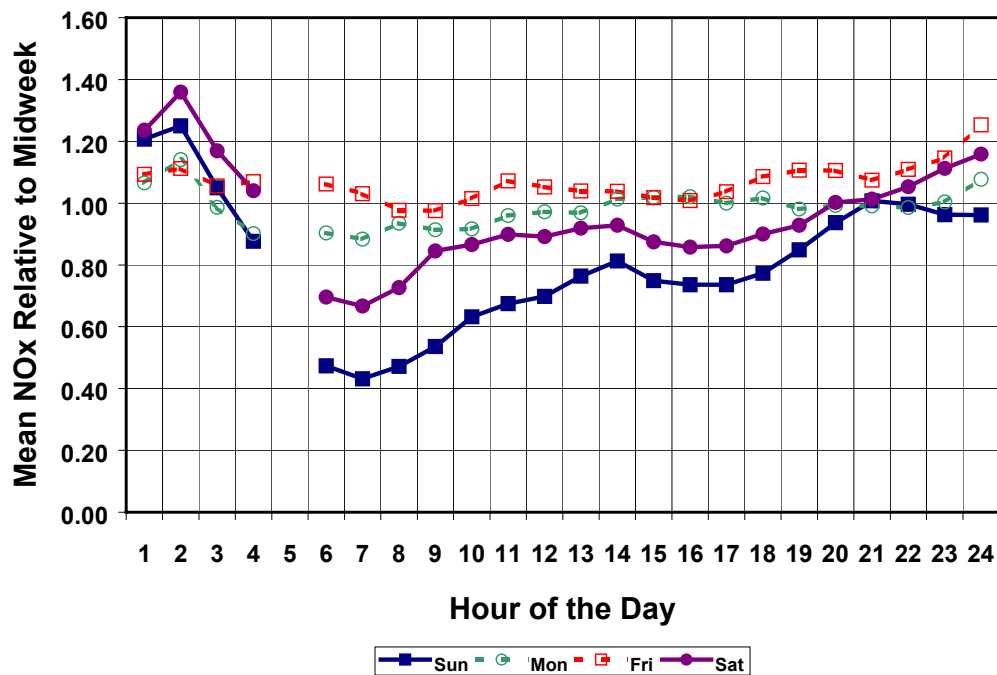


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**Figure 5.3-42 Nitrogen oxides profiles by day of week at Lynwood, based on data for the May – October ozone seasons of 1996-1998.**

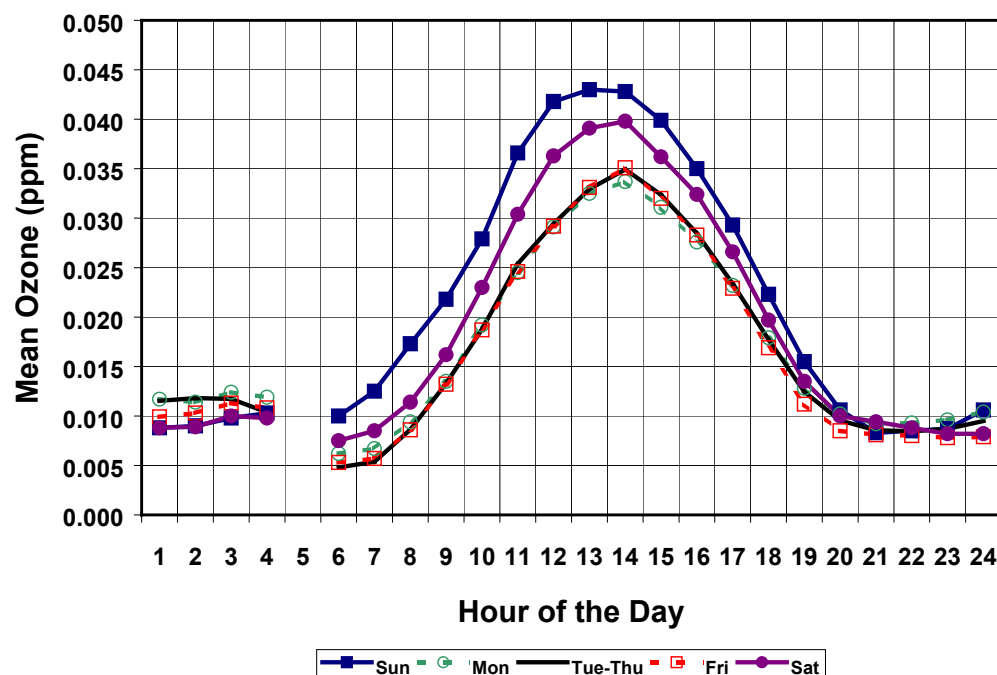


**Figure 5.3-43 Nitrogen oxides profiles for Lynwood, expressed as a proportion of the midweek values.**

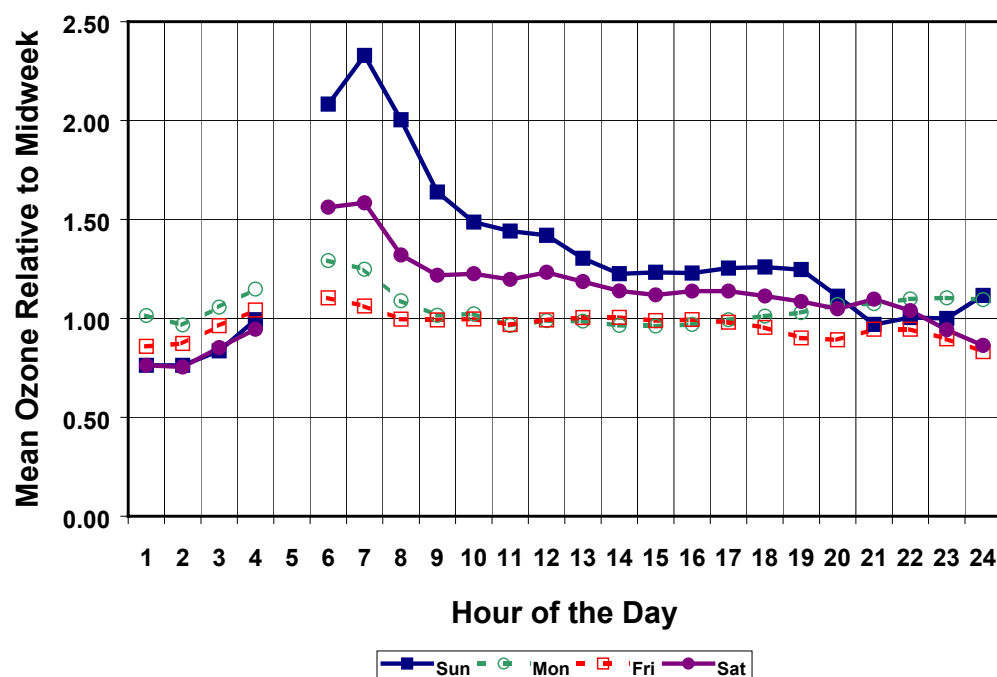


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**Figure 5.3-44 Ozone profiles by day of week at Lynwood, based on data for the May – October ozone seasons of 1996-1998.**

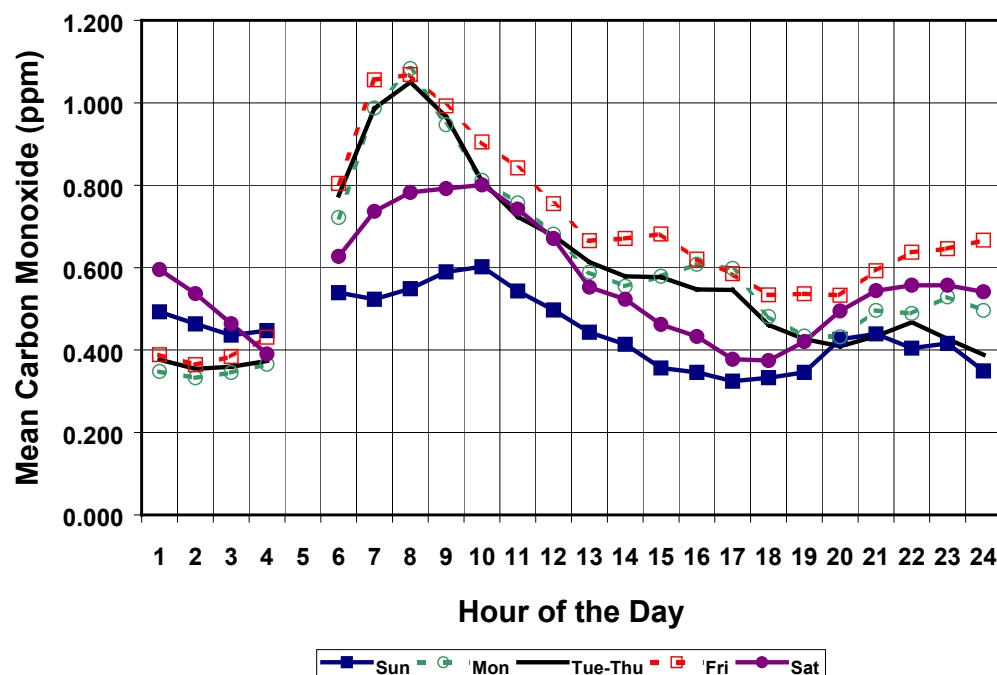


**Figure 5.3-45 Ozone profiles for Lynwood, expressed as a proportion of the midweek values.**

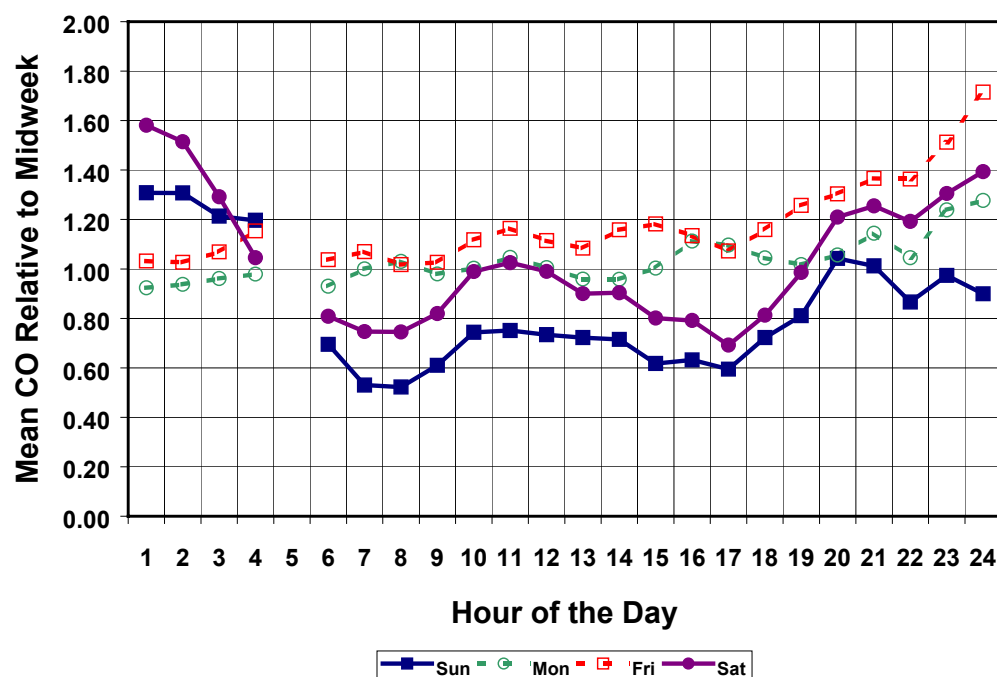


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**Figure 5.3-46 Carbon monoxide profiles by day of week at N. Long Beach, based on data for the May – October ozone seasons of 1996-1998.**

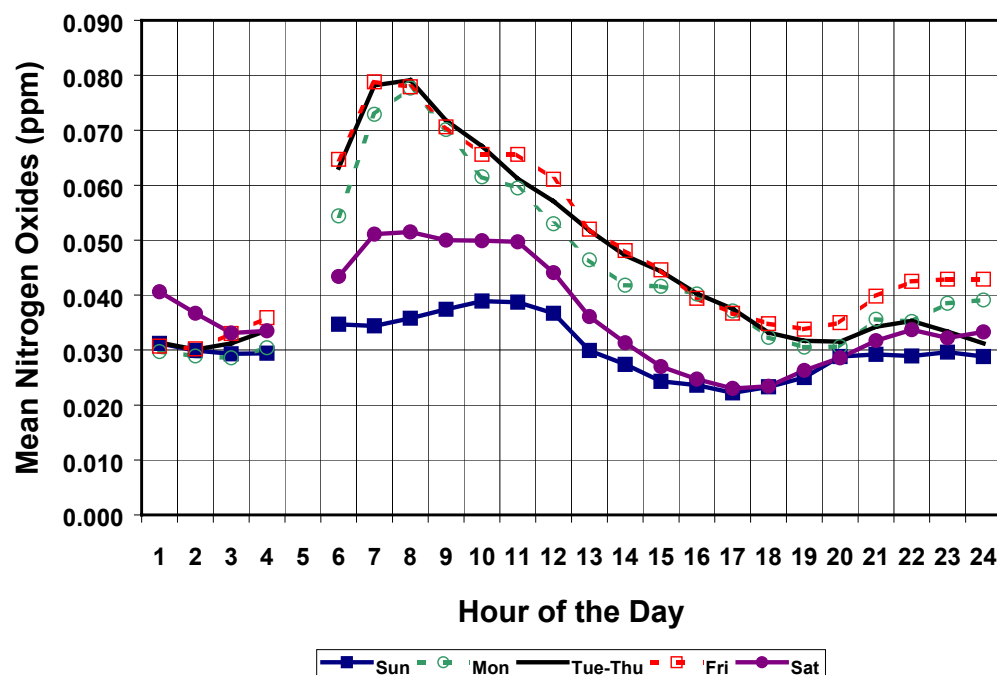


**Figure 5.3-47 Carbon monoxide profiles for N. Long Beach, expressed as a proportion of the midweek values.**

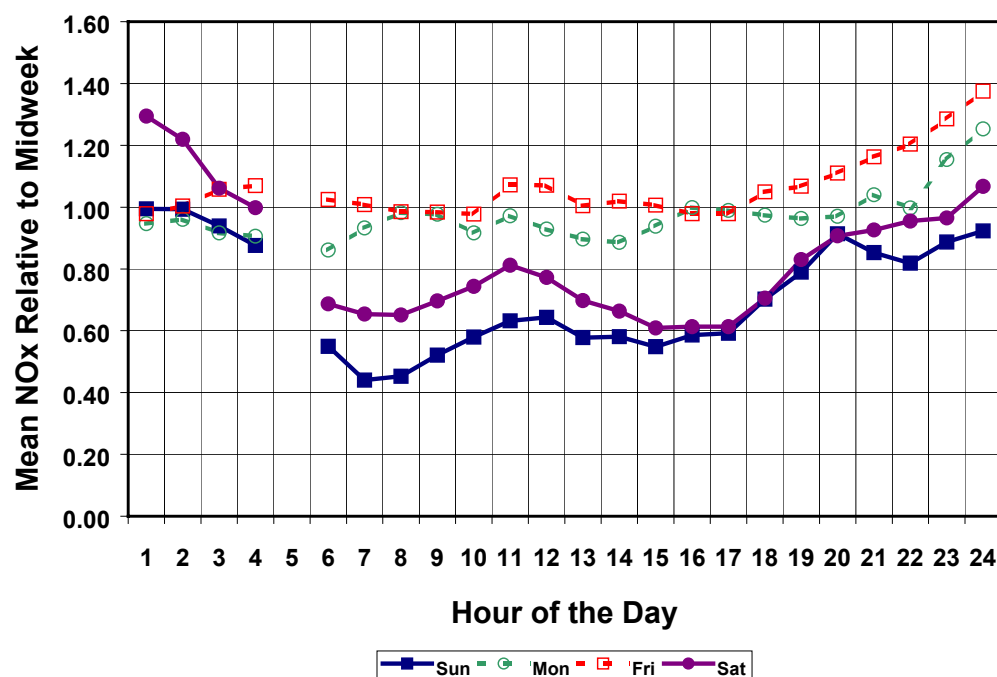


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**Figure 5.3-48 Nitrogen oxides profiles by day of week at N. Long Beach, based on data for the May – October ozone seasons of 1996-1998.**



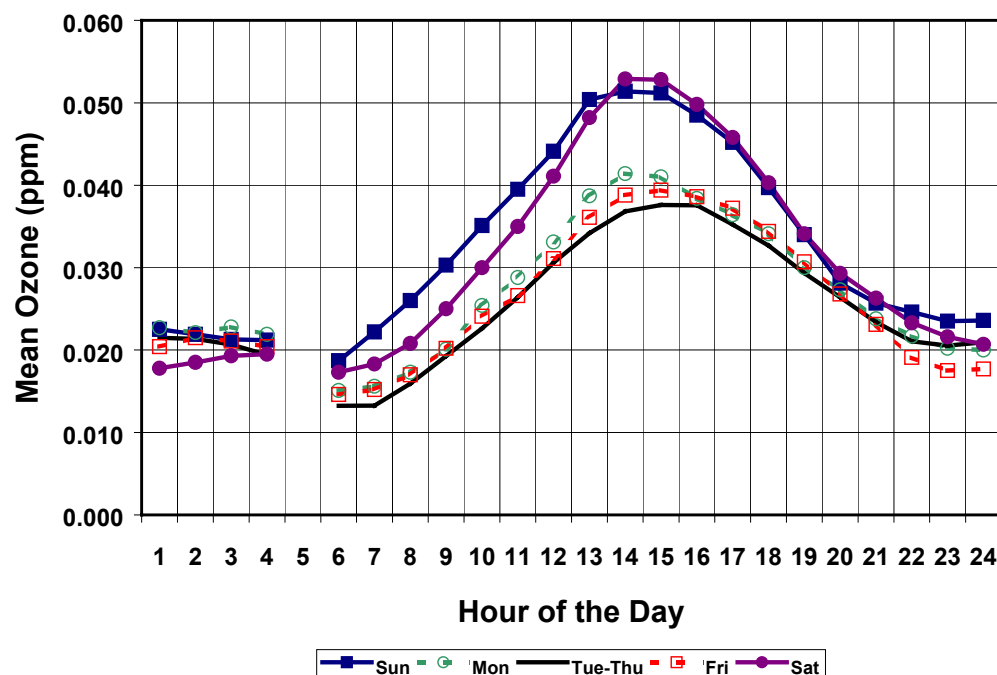
**Figure 5.3-49 Nitrogen oxides profiles for N. Long Beach, expressed as a proportion of the midweek values.**



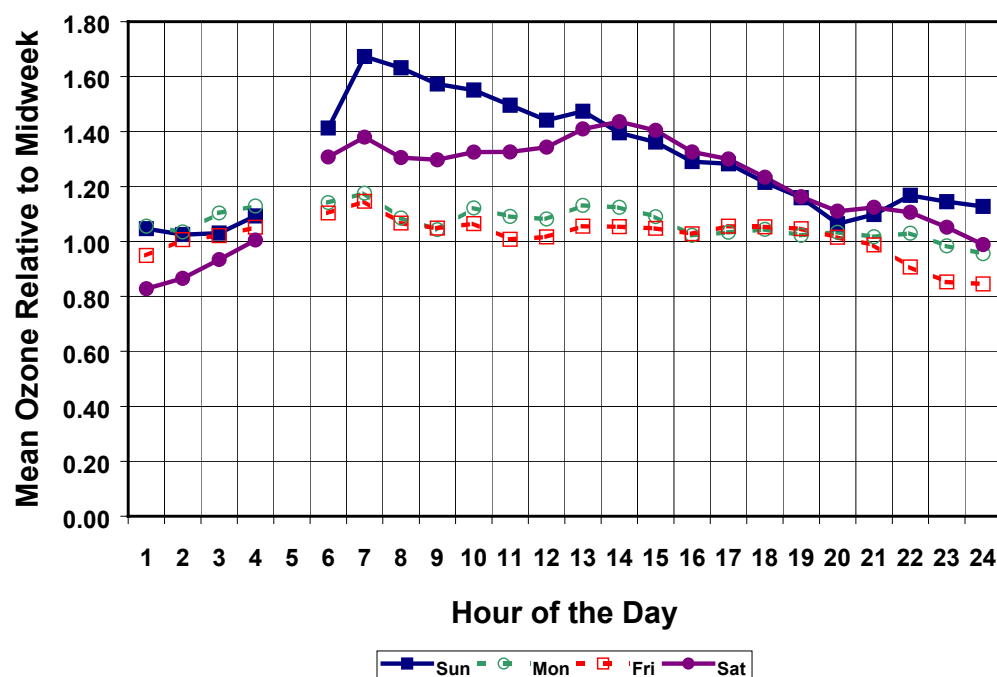


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**Figure 5.3-50 Ozone profiles by day of week at N. Long Beach, based on data for the May – October ozone seasons of 1996-1998.**

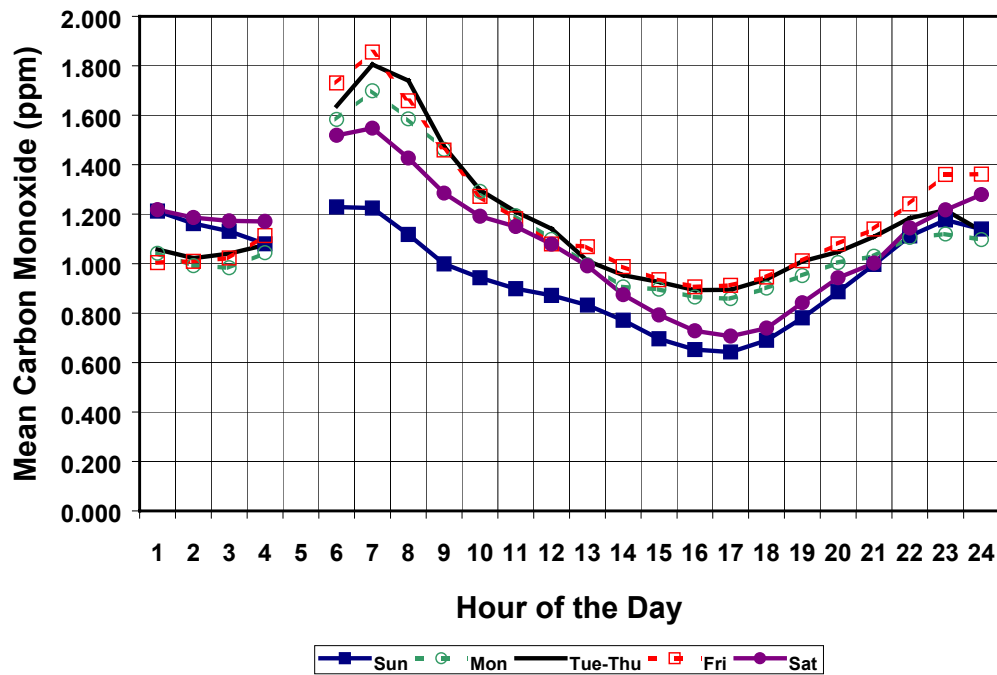


**Figure 5.3-51 Ozone profiles for N. Long Beach, expressed as a proportion of the midweek values.**

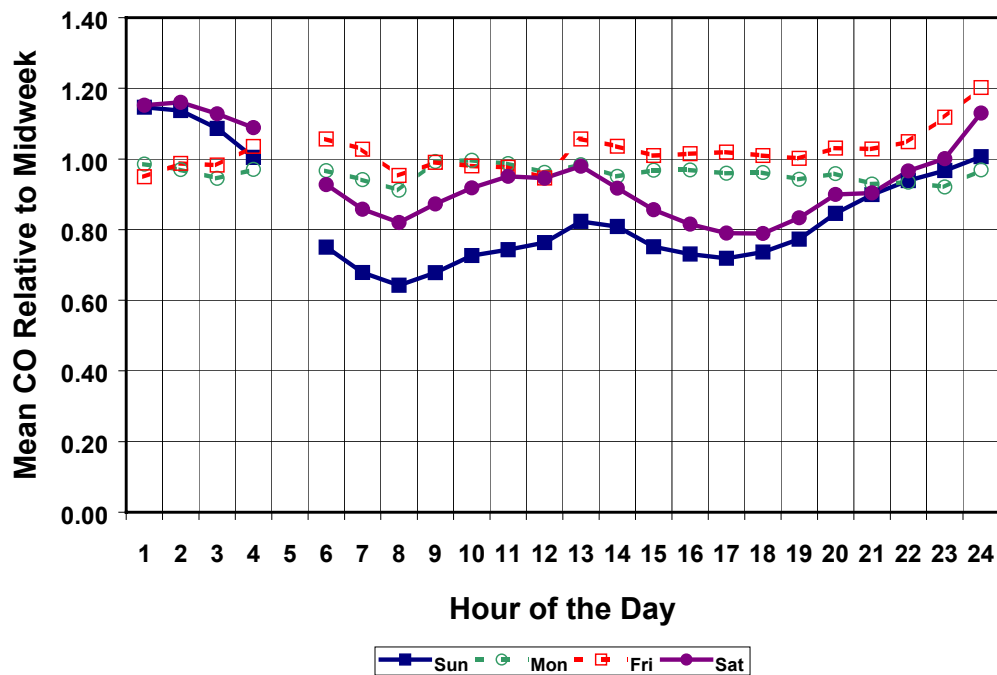


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**Figure 5.3-52 Carbon monoxide profiles by day of week at Pico Rivera, based on data for the May – October ozone seasons of 1996-1998.**

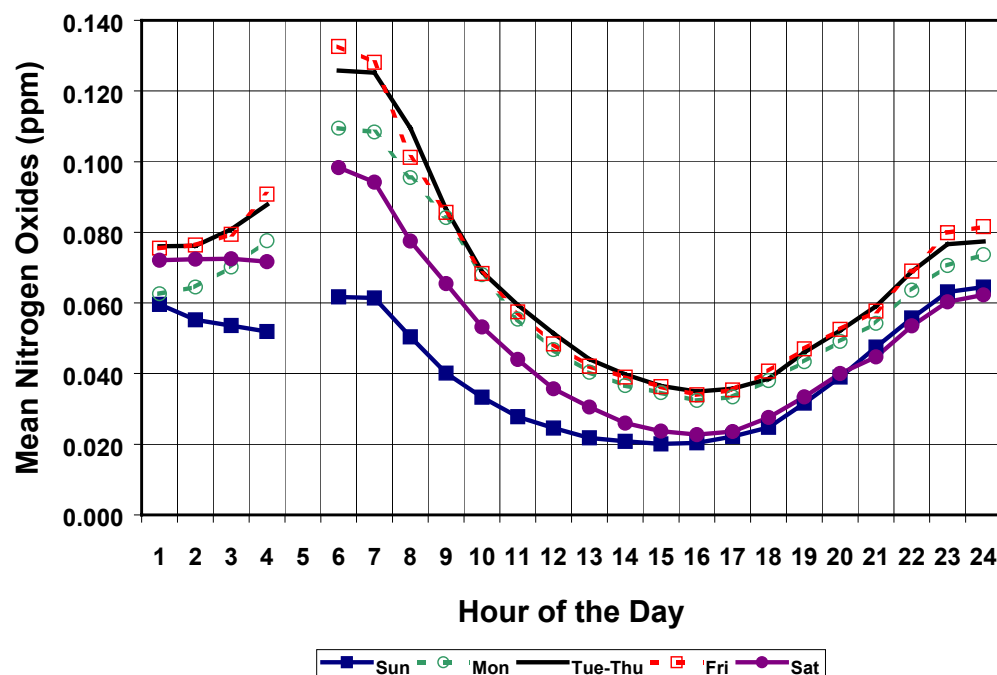


**Figure 5.3-53 Carbon monoxide profiles for Pico Rivera, expressed as a proportion of the midweek values.**

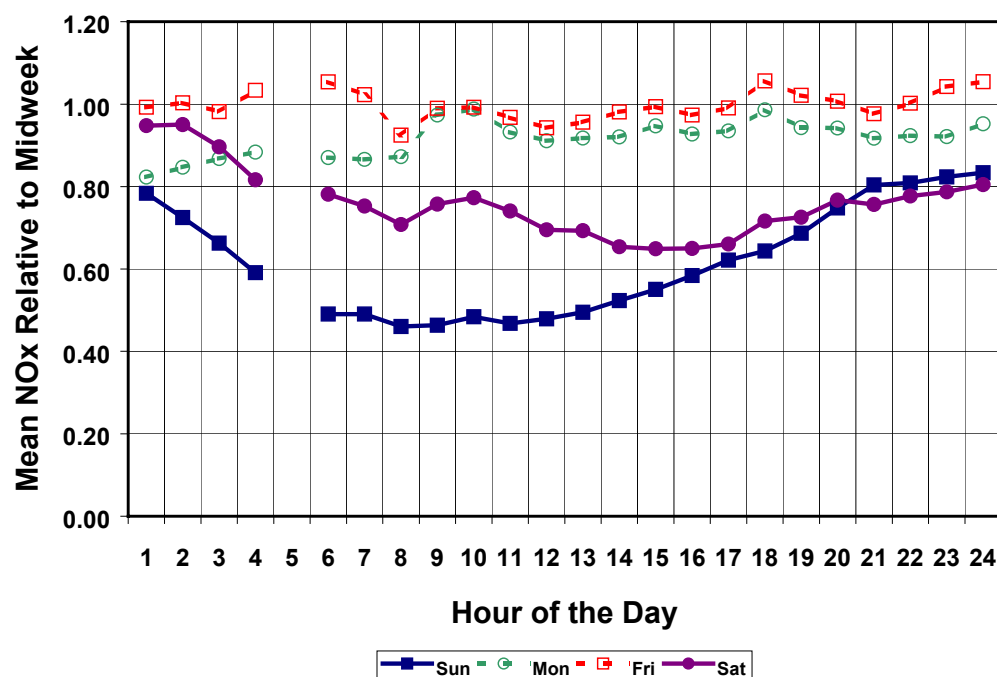


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**Figure 5.3-54 Nitrogen oxides profiles by day of week at Pico Rivera, based on data for the May – October ozone seasons of 1996-1998.**

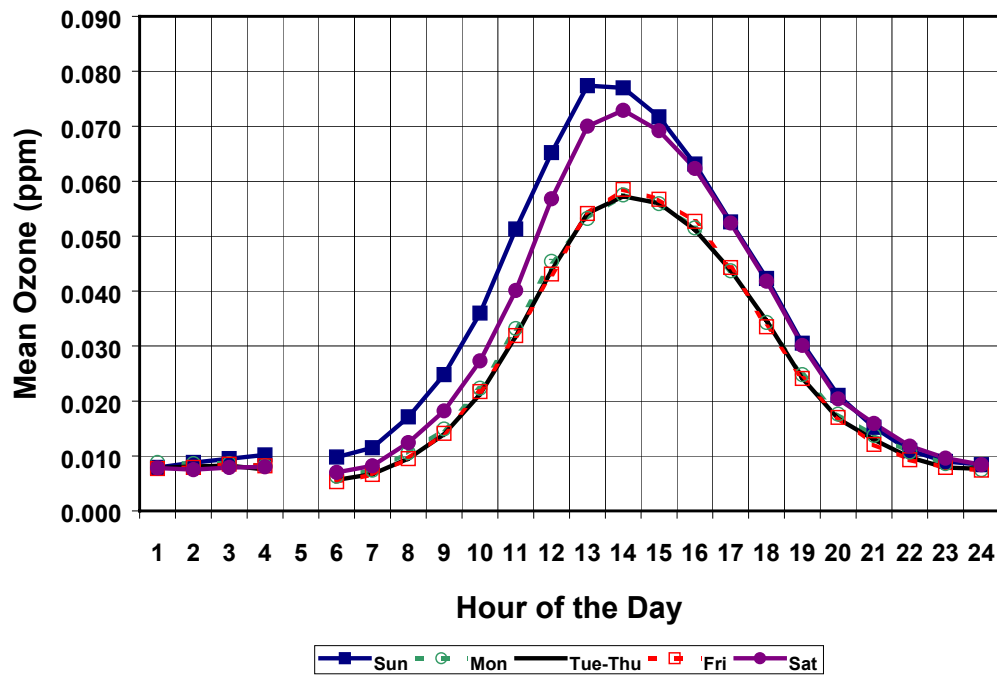


**Figure 5.3-55 Nitrogen oxides profiles for Pico Rivera, expressed as a proportion of the midweek values.**

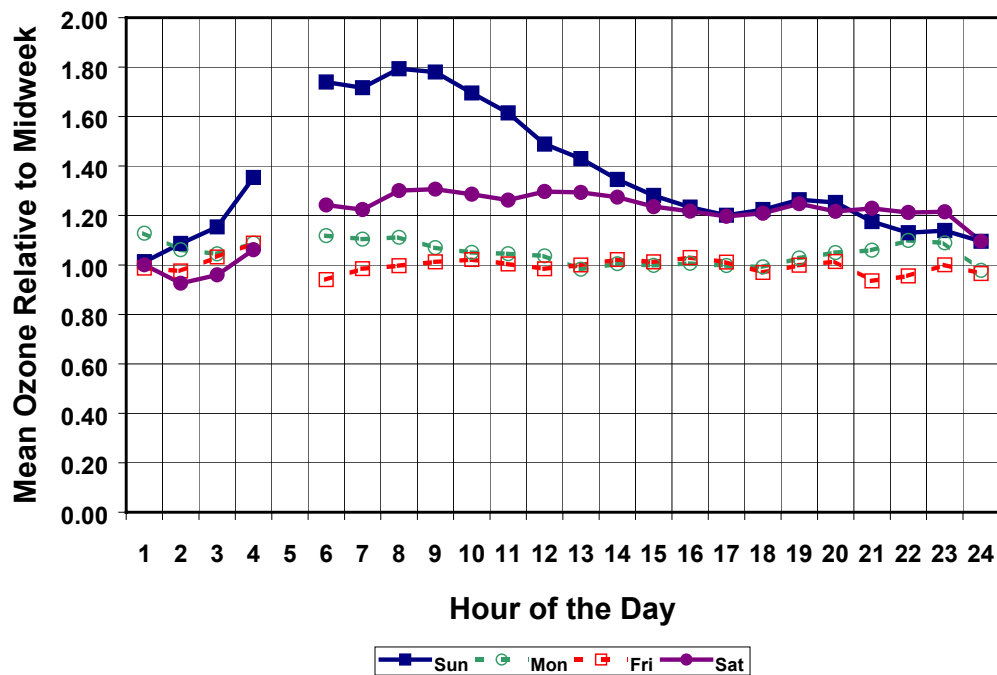


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**Figure 5.3-56 Ozone profiles by day of week at Pico Rivera, based on data for the May – October ozone seasons of 1996-1998.**

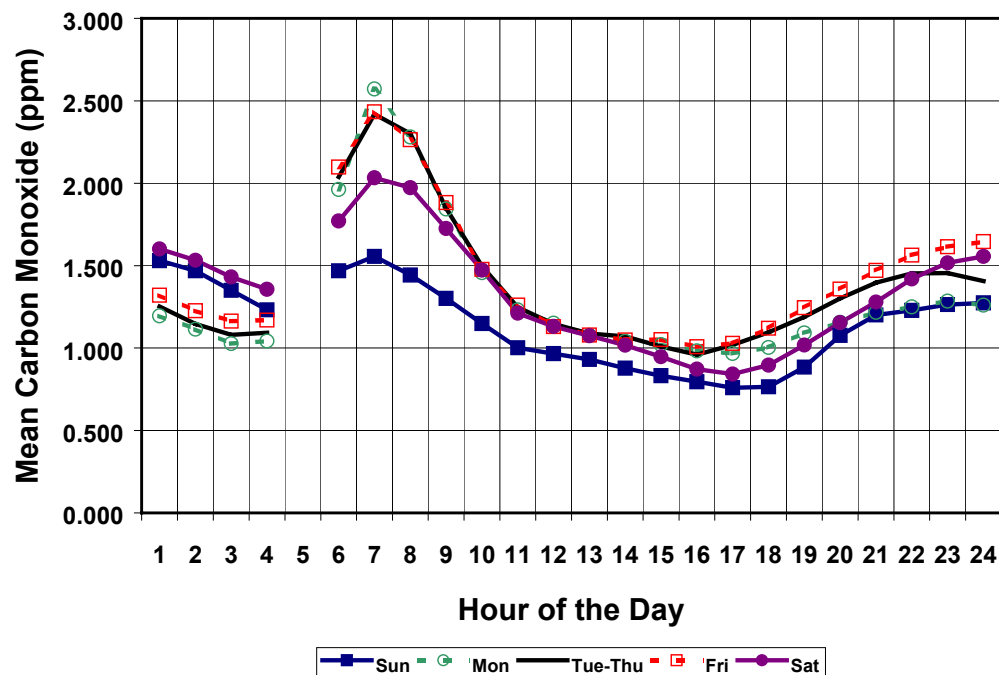


**Figure 5.3-57 Ozone profiles for Pico Rivera, expressed as a proportion of the midweek values.**

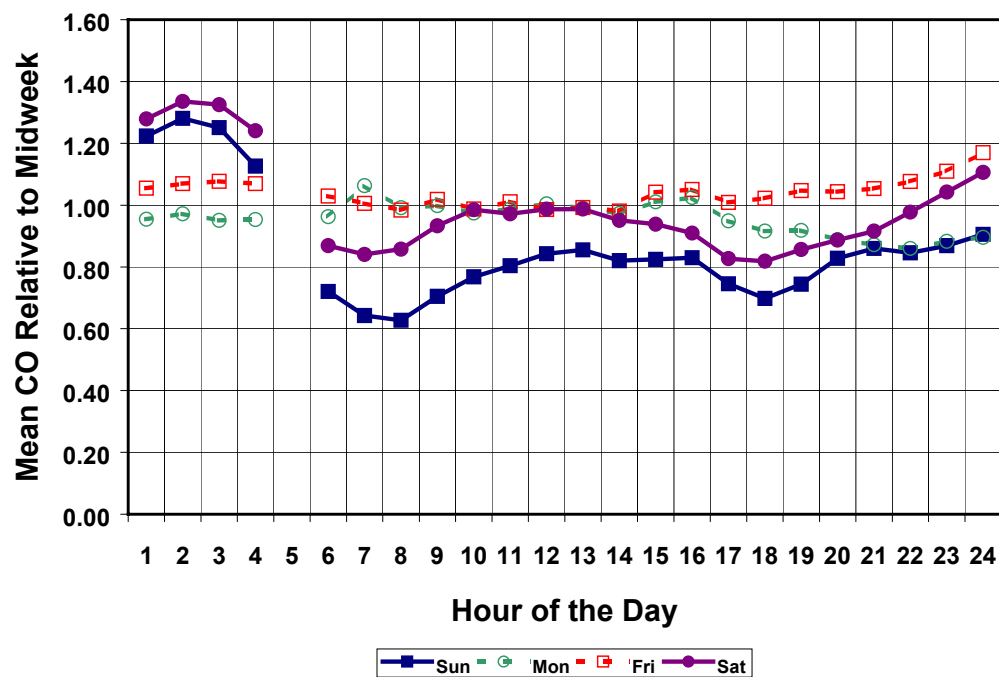


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**Figure 5.3-58 Carbon monoxide profiles by day of week at Pomona, based on data for the May – October ozone seasons of 1996-1998.**

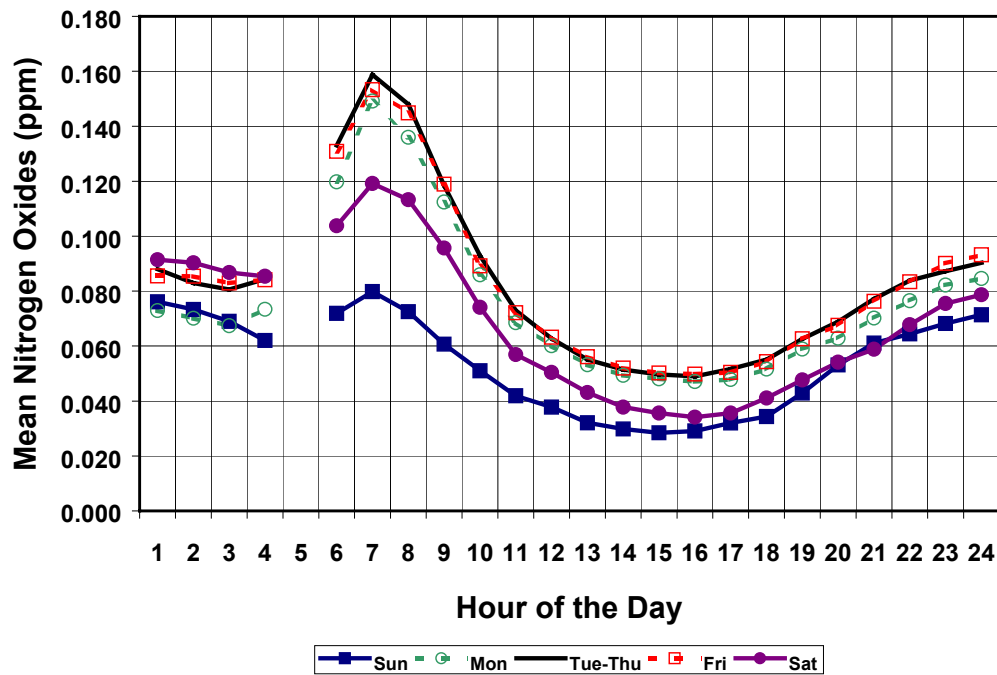


**Figure 5.3-59 Carbon monoxide profiles for Pomona, expressed as a proportion of the midweek values.**

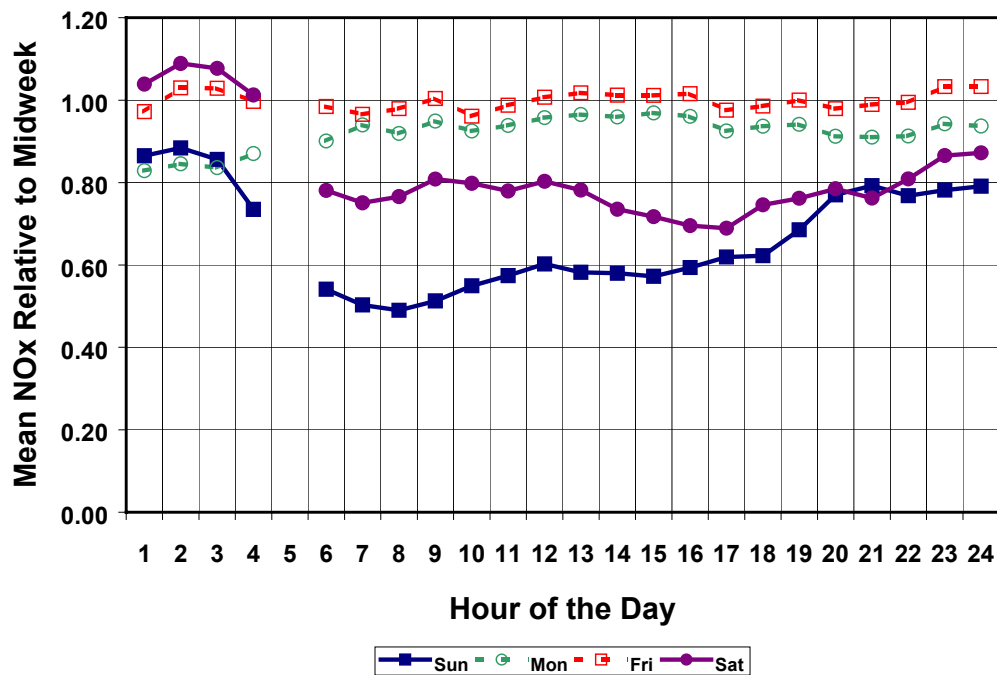


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**Figure 5.3-60 Nitrogen oxides profiles by day of week at Pomona, based on data for the May – October ozone seasons of 1996-1998.**

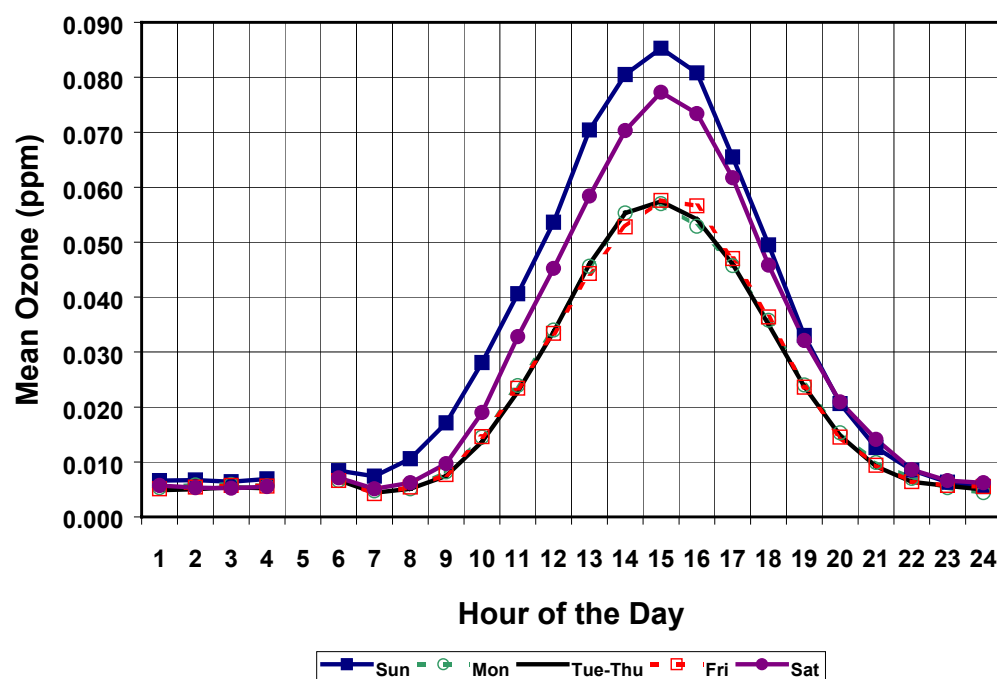


**Figure 5.3-61 Nitrogen oxides profiles for Pomona, expressed as a proportion of the midweek values.**

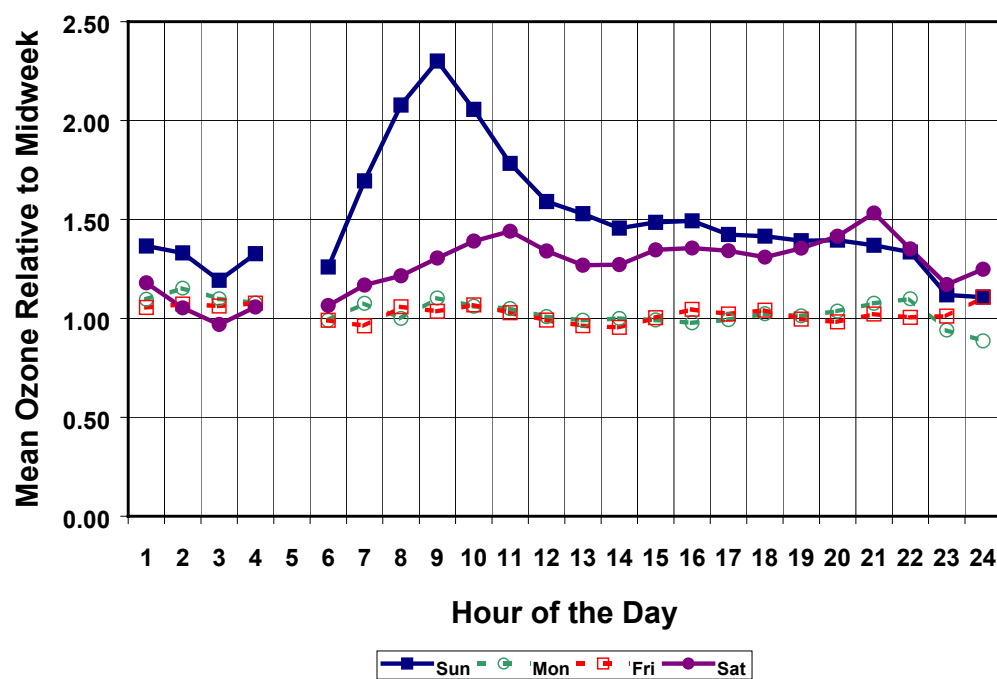


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**Figure 5.3-62 Ozone profiles by day of week at Pomona, based on data for the May – October ozone seasons of 1996-1998.**

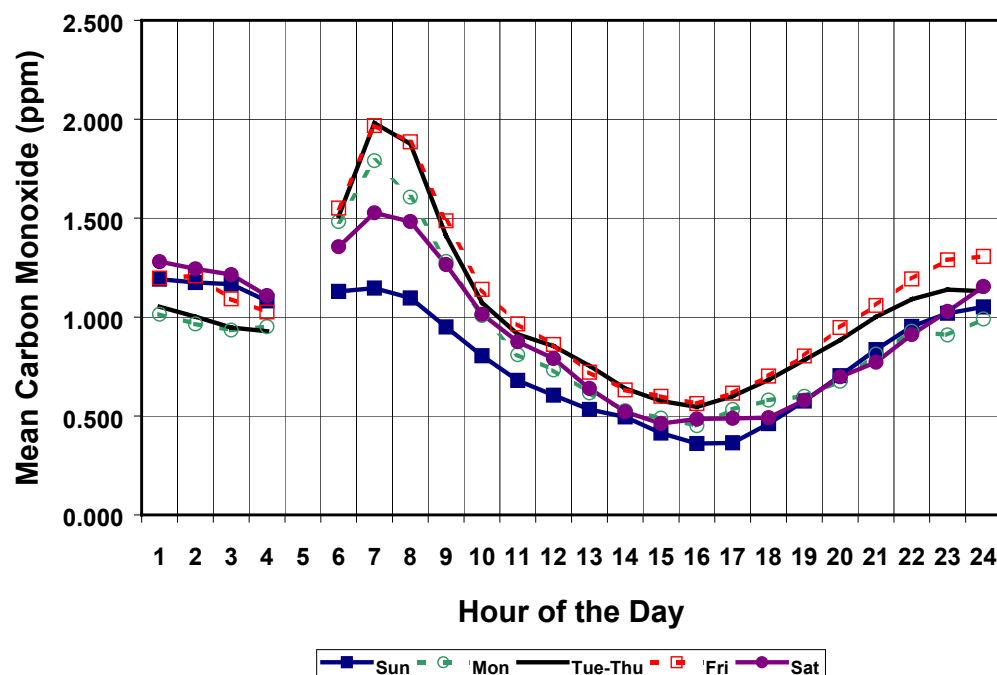


**Figure 5.3-63 Ozone profiles for Pomona, expressed as a proportion of the midweek values.**

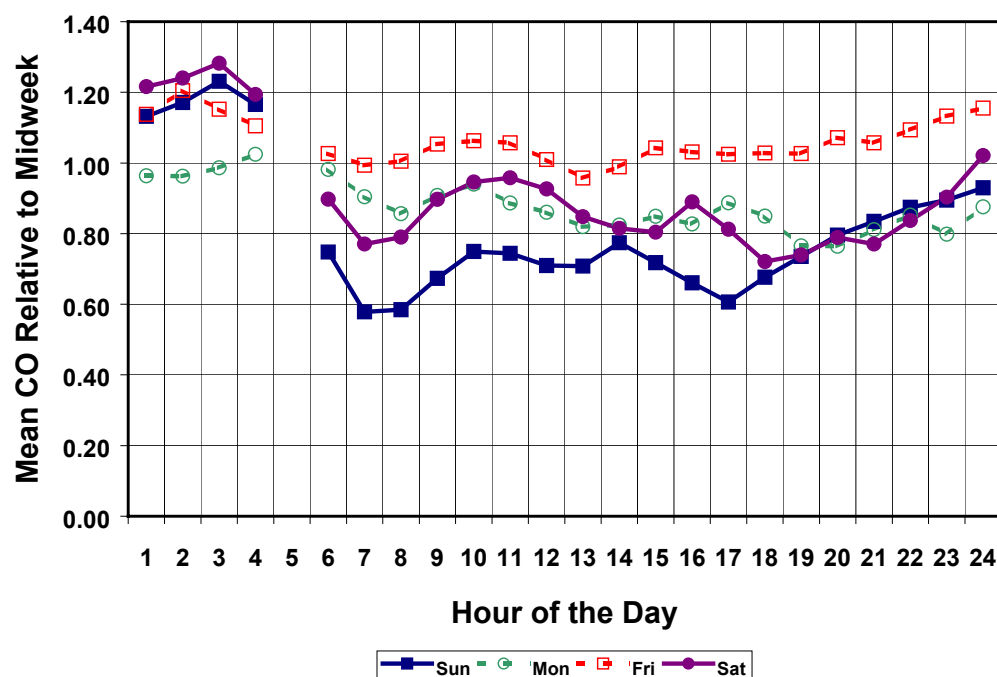


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**Figure 5.3-64 Carbon monoxide profiles by day of week at Reseda, based on data for the May – October ozone seasons of 1996-1998.**



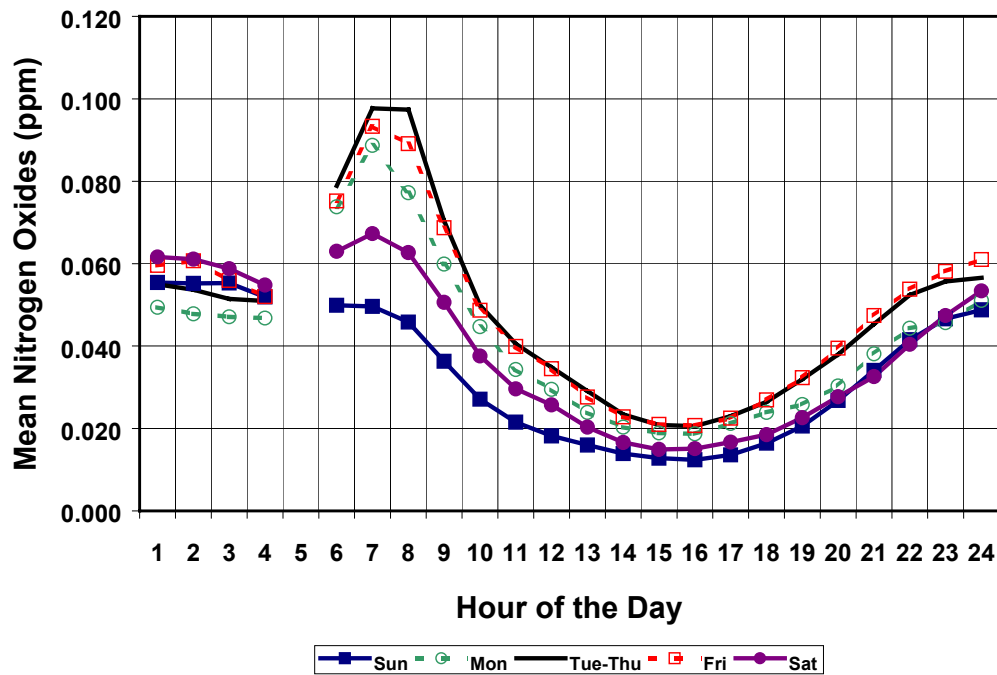
**Figure 5.3-65 Carbon monoxide profiles for Reseda, expressed as a proportion of the midweek values.**



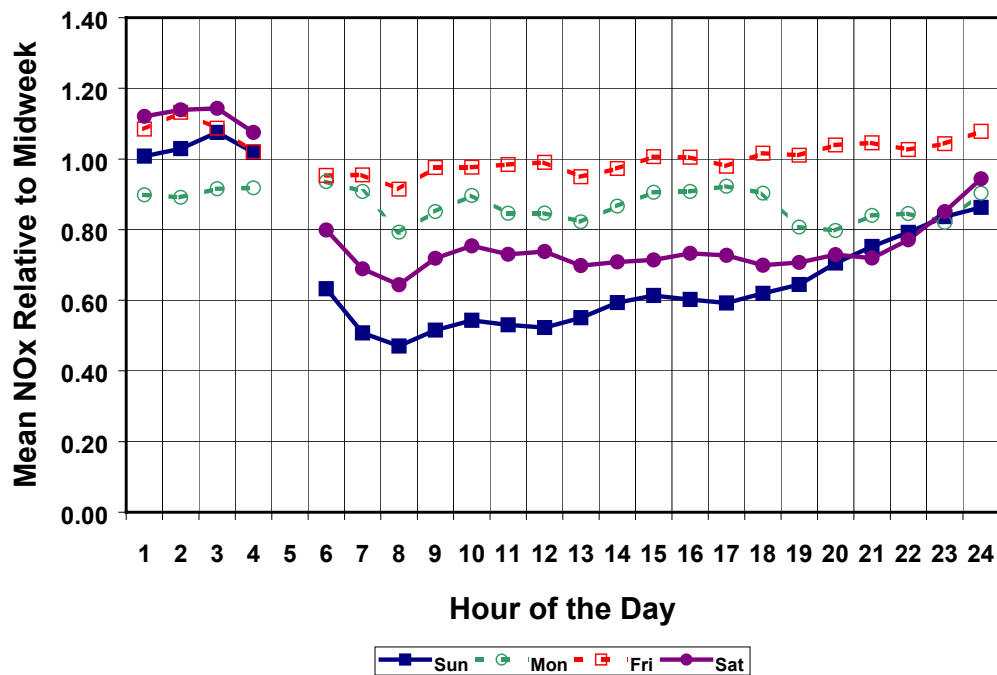


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**Figure 5.3-66 Nitrogen oxides profiles by day of week at Reseda, based on data for the May – October ozone seasons of 1996-1998.**

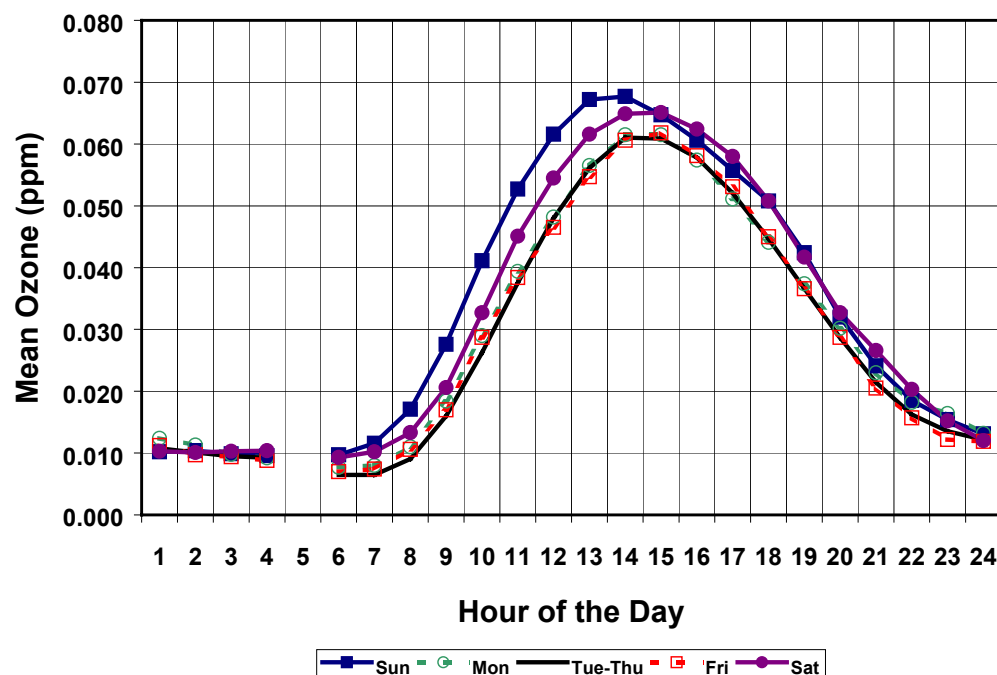


**Figure 5.3-67 Nitrogen oxides profiles for Reseda, expressed as a proportion of the midweek values.**

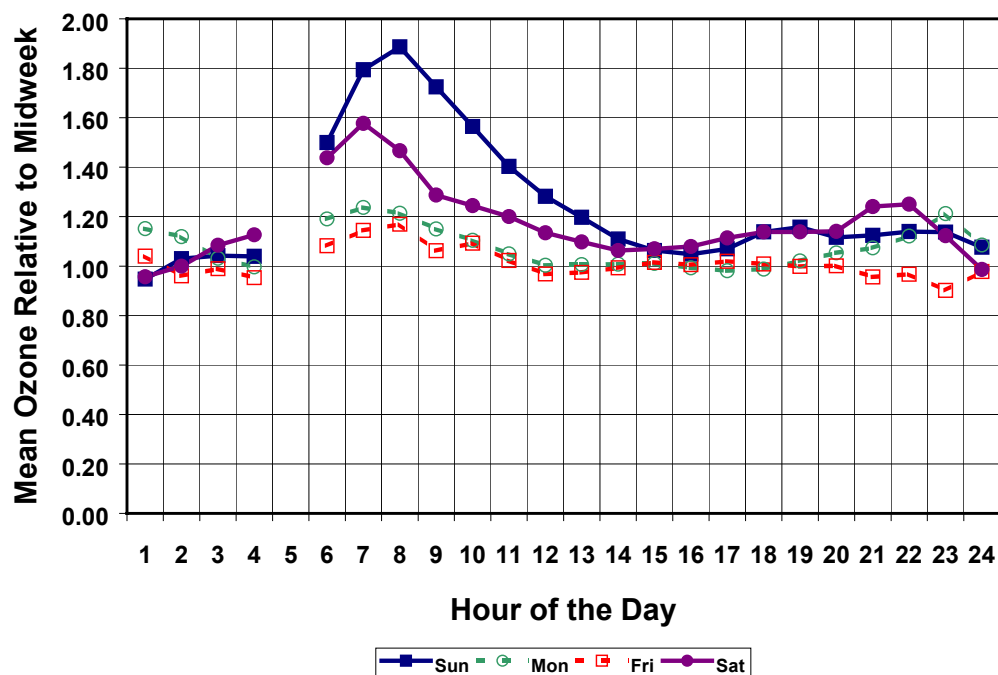


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**Figure 5.3-68 Ozone profiles by day of week at Reseda, based on data for the May – October ozone seasons of 1996-1998.**

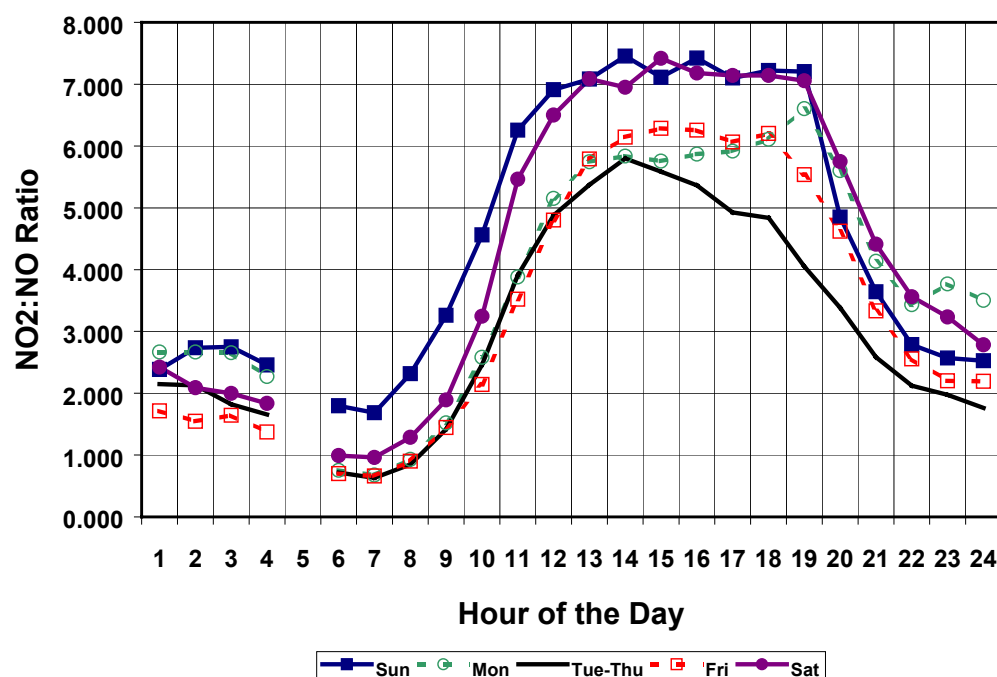


**Figure 5.3-69 Ozone profiles for Reseda, expressed as a proportion of the midweek values.**

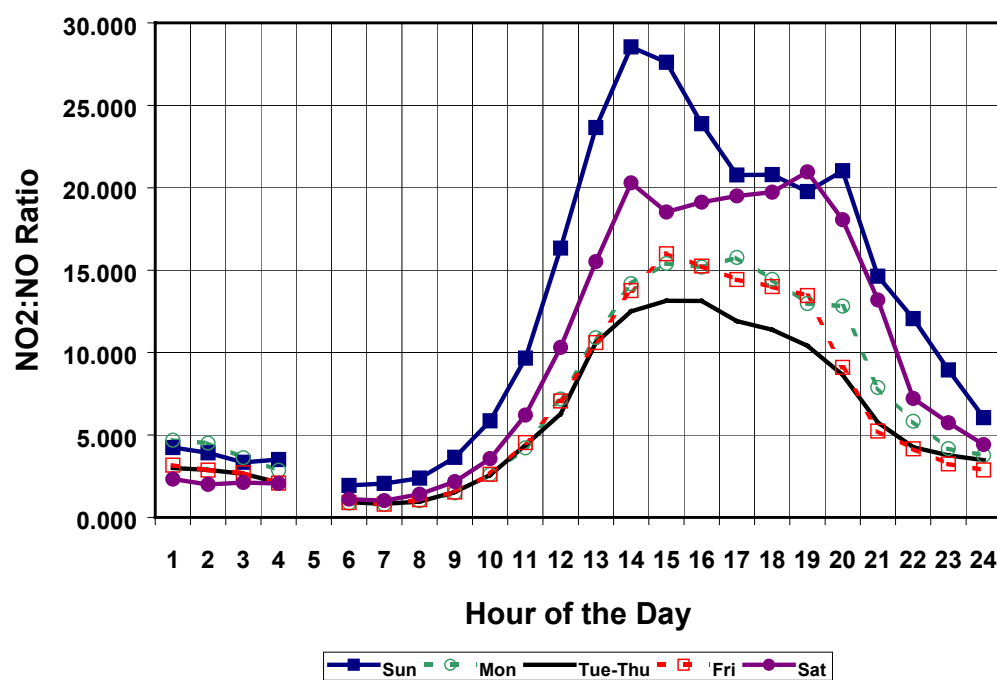


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**Figure 5.3-70 Profiles for NO<sub>2</sub>:NO by day of week at Anaheim, based on data for the May – October ozone seasons of 1996-1998.**



**Figure 5.3-71 Profiles for NO<sub>2</sub>:NO by day of week at Azusa, based on data for the May – October ozone seasons of 1996-1998.**



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Figure 5.3-72 Profiles for NO<sub>2</sub>:NO by day of week at Burbank, based on data for the May – October ozone seasons of 1996-1998.

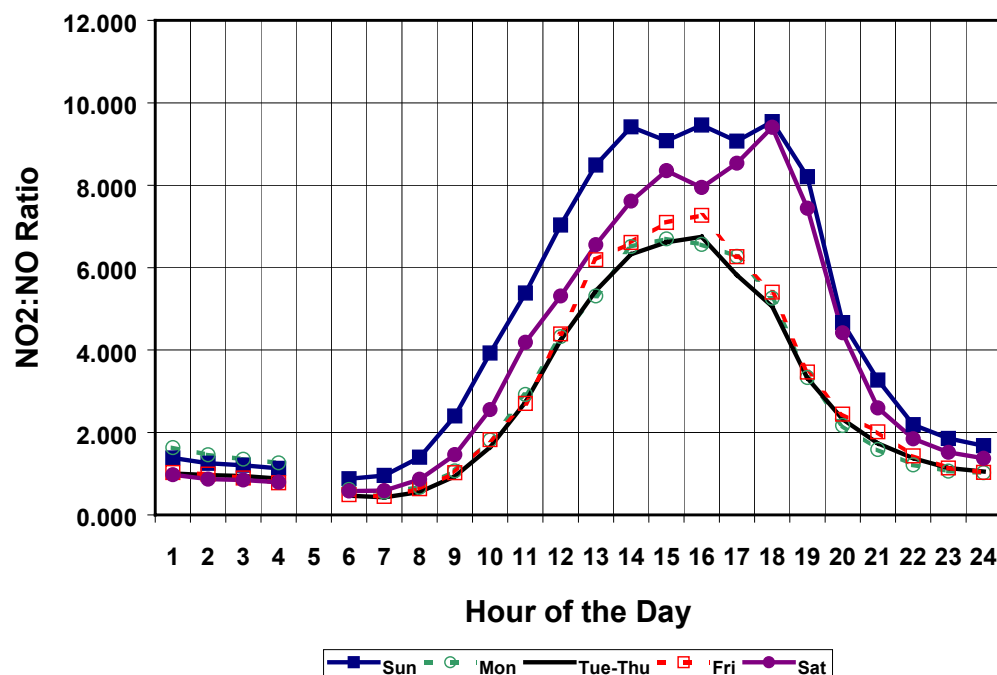
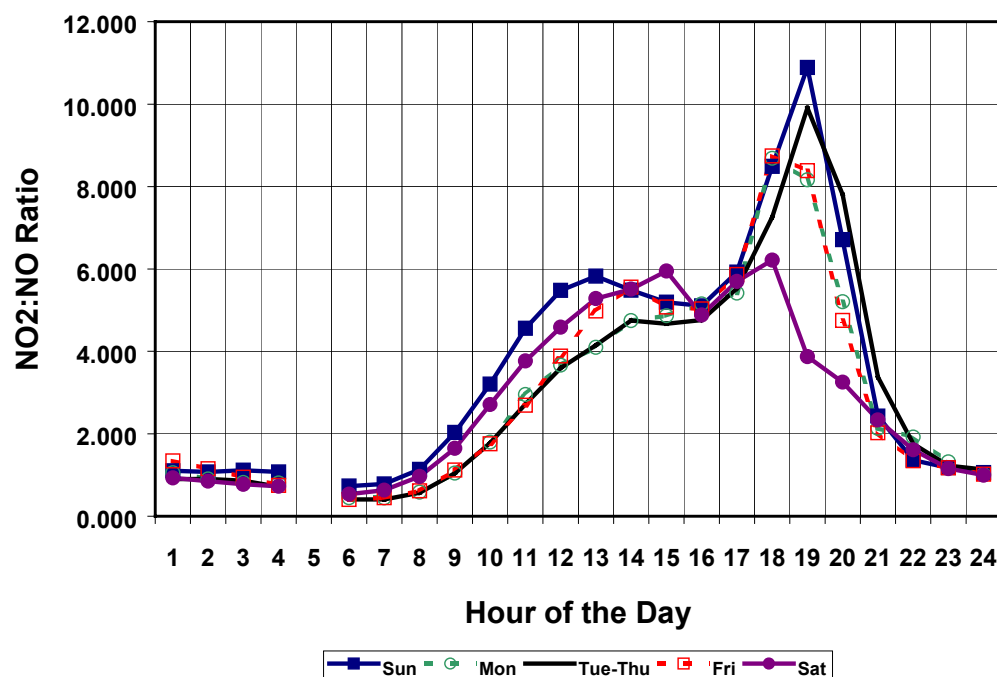
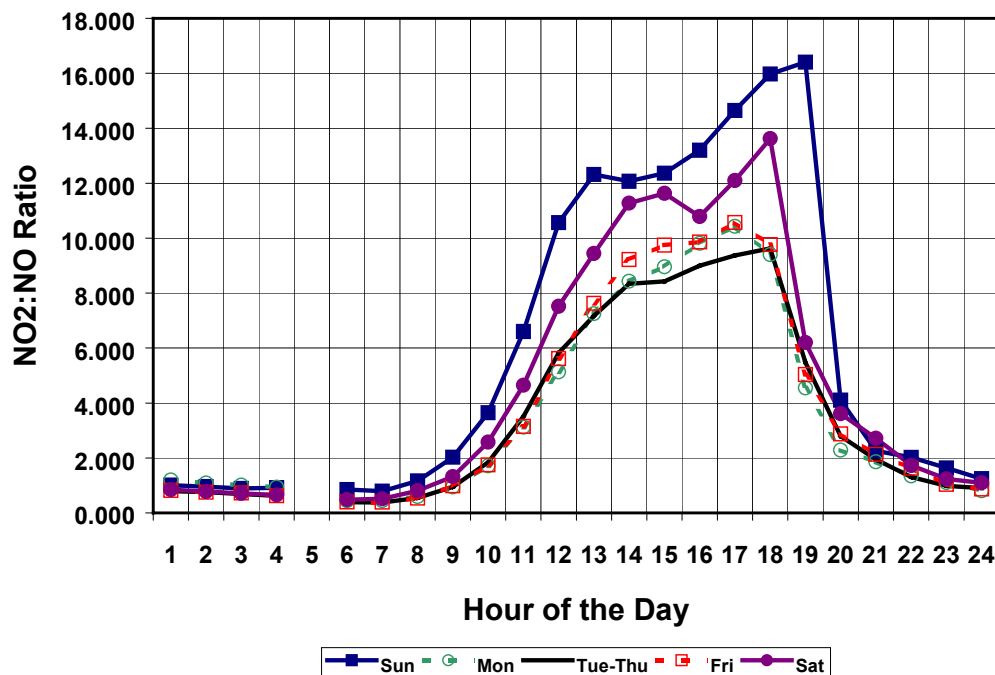


Figure 5.3-73 Profiles for NO<sub>2</sub>:NO by day of week at Hawthorne, based on data for the May – October ozone seasons of 1996-1998.

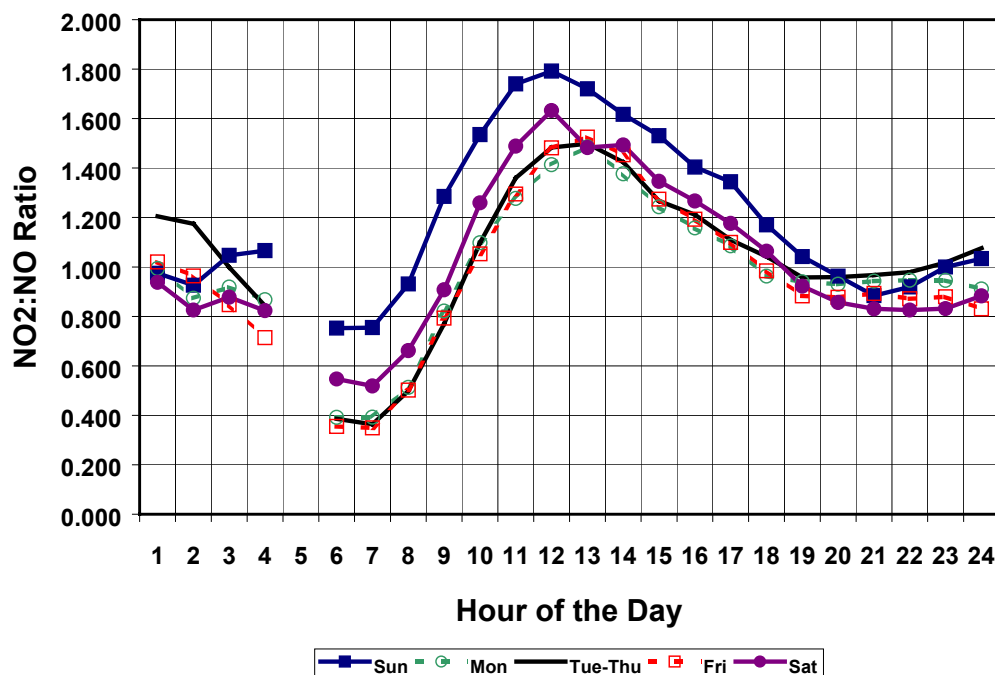


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**Figure 5.3-74 Profiles for NO<sub>2</sub>:NO by day of week at L.A.-N. Main, based on data for the May – October ozone seasons of 1996-1998.**



**Figure 5.3-75 Profiles for NO<sub>2</sub>:NO by day of week at Lynwood, based on data for the May – October ozone seasons of 1996-1998.**



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Figure 5.3-76 Profiles for NO<sub>2</sub>:NO by day of week at N. Long Beach, based on data for the May – October ozone seasons of 1996-1998.

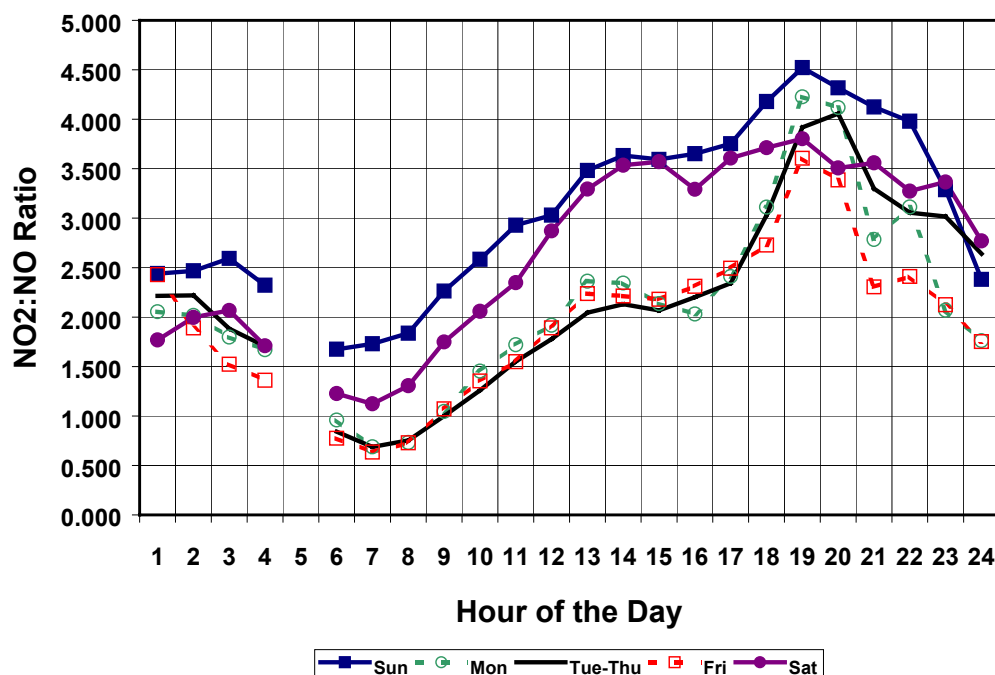
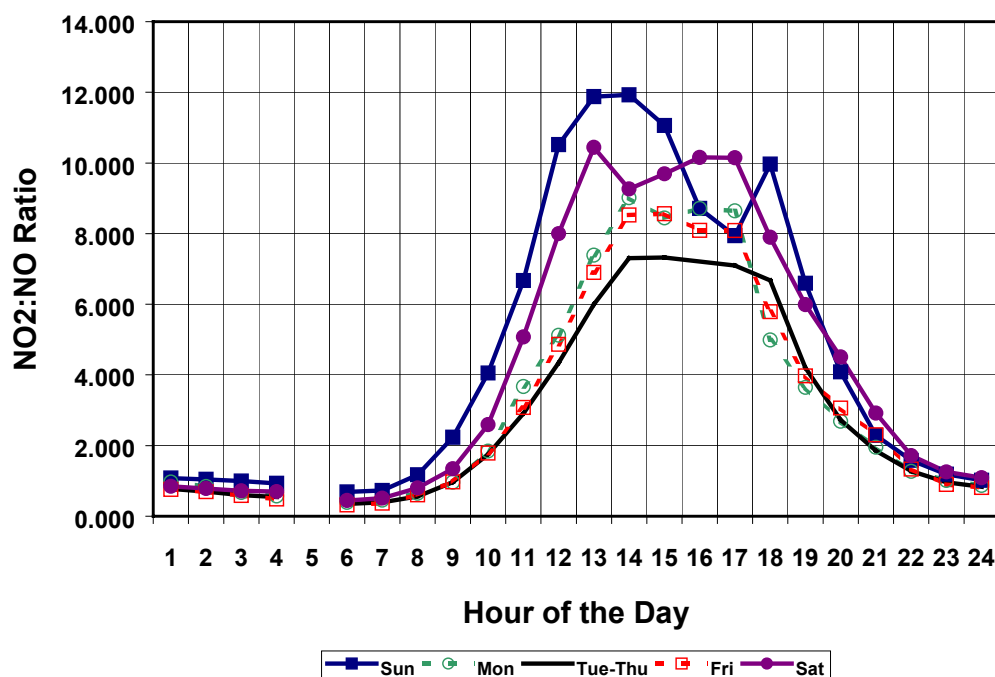
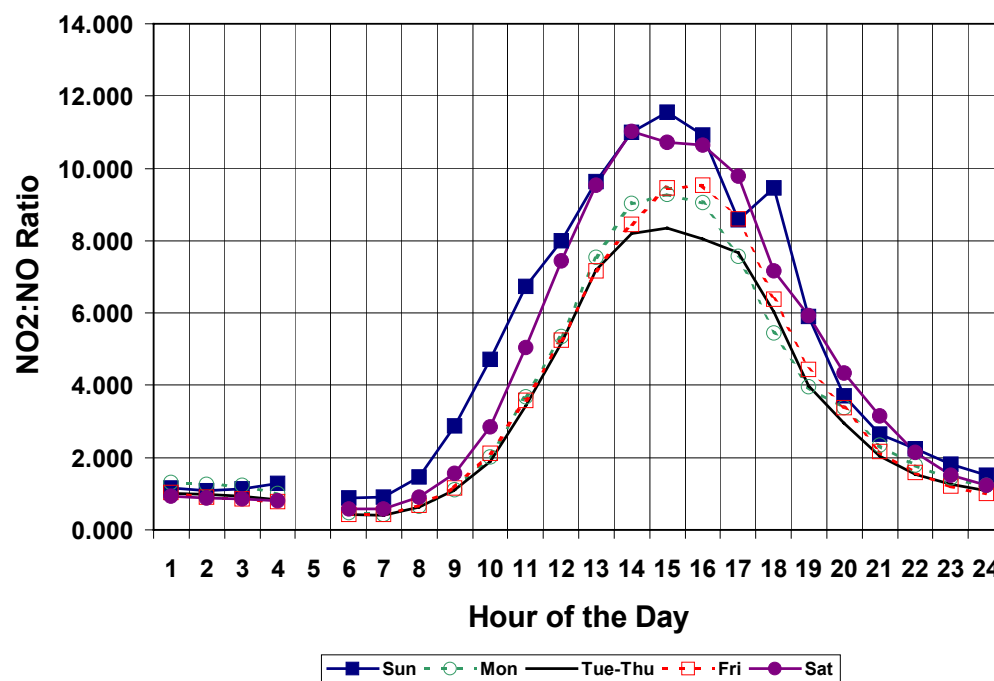


Figure 5.3-77 Profiles for NO<sub>2</sub>:NO by day of week at Pico Rivera, based on data for the May – October ozone seasons of 1996-1998.

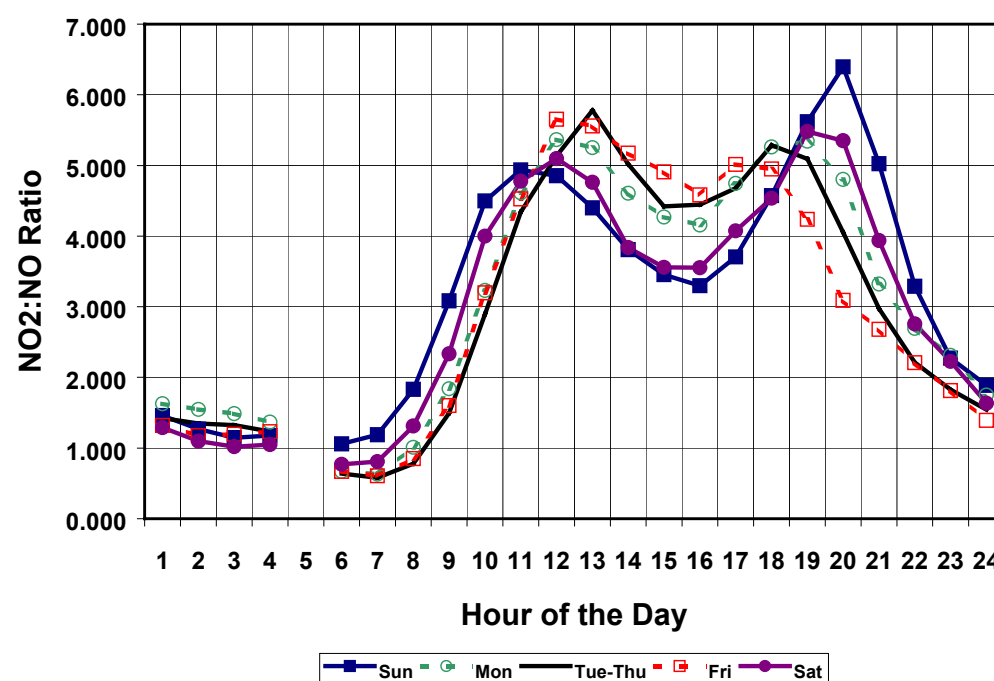


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**Figure 5.3-78 Profiles for NO<sub>2</sub>:NO by day of week at Pomona, based on data for the May – October ozone seasons of 1996-1998.**



**Figure 5.3-79 Profiles for NO<sub>2</sub>:NO by day of week at Reseda, based on data for the May – October ozone seasons of 1996-1998.**



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